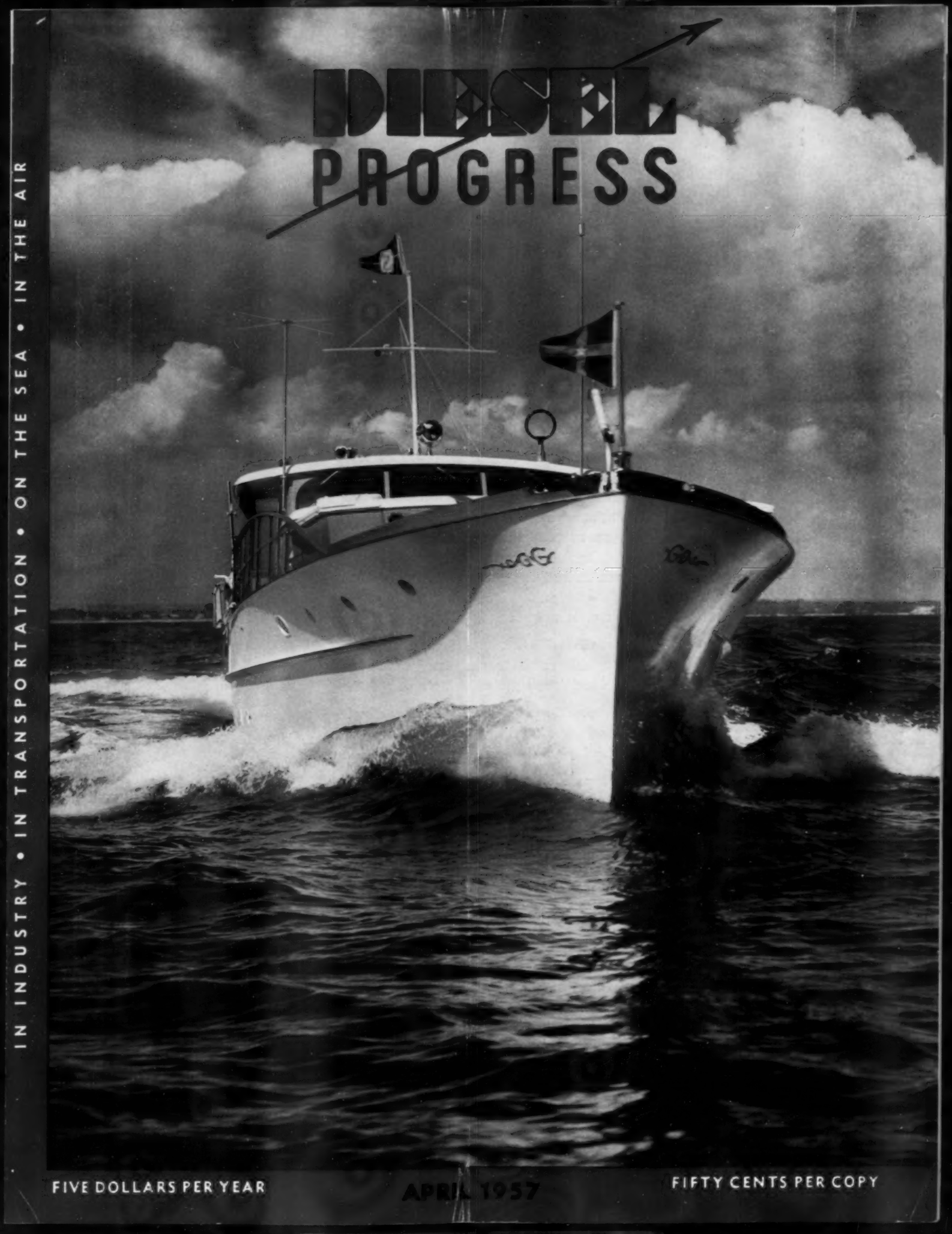
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FRONT COVER ILLUSTRATION

Neval, 73 ft designed and built by Henry C. Grebe & Co. of Chicago, for O. A. Sutton of Wichita, Kansas. It is equipped with two 3-71 GM diesels and attains a speed of 17 mph cruising 14 miles. It is air conditioned, and equipped aft for [illegible]

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WOODWARD
TYPE LSG
LOAD-SENSING
GOVERNOR

for Engine and Turbine Driven Generator Sets

TYPE LSG

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IT PROVIDES

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3. Constant steady-state speed, regardless of load, within capacity of engine.
4. Minimum speed deviation following a load change.
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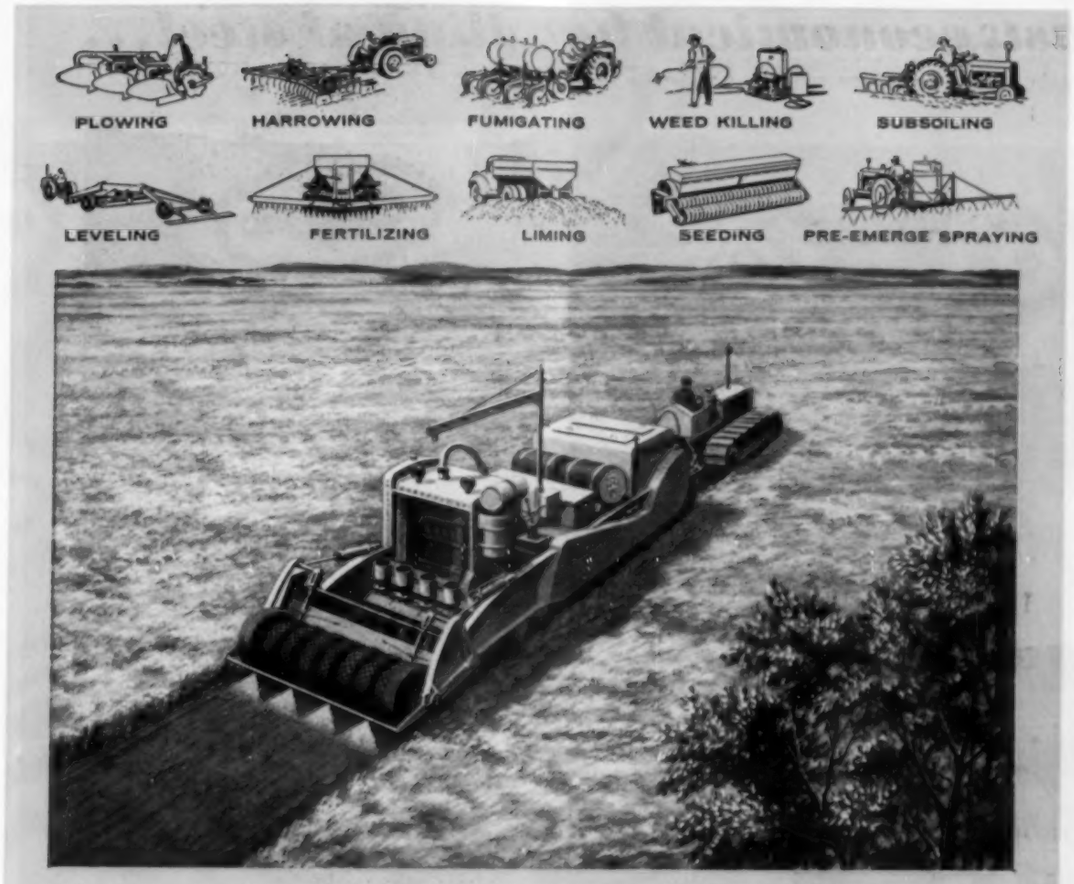


SHELL RIMULA OIL selected for crankcase lubrication by

WONSOVER

ONE machine designed to do 10 Farm Jobs at once!

Wonsover, a new multi-purpose agricultural machine, is designed to eliminate individual farm operations. It performs many time-consuming jobs simultaneously. Wonsover is said to perform many multi-farming operations in just one sweep.

Norton-Portland Corporation at Portland, Maine, the manufacturers of Wonsover, selected Rimula* Oil as the recommended crankcase lubricant for maximum performance. Here are several reasons Wonsover chose this lubricant:

1. Shell Rimula Oil eliminates cylinder and bearing pitting caused by acid residue from incomplete combustion and low jacket temperature.

2. With Shell Rimula Oil engine parts stay clean and operate efficiently for longer periods . . . effecting worthwhile savings in labor and parts.

If you operate heavy-duty engines, gasoline or diesel, let your Shell Industrial Representative show you the many benefits of using Rimula Oil. For more information, write to Shell Oil Company, 50 West 50th St., New York 20, N. Y.; or 100 Bush St., San Francisco 6, California.

*Trademark

Other Shell lubricants used by Wonsover:

SHELL SPIRAX EP—for transmissions*

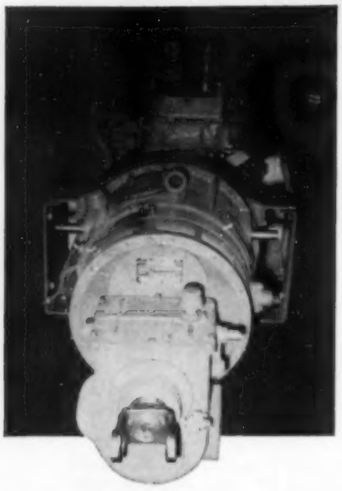
SHELL TELLUS OIL—for hydraulic circuits

SHELL RETINAX A—for all grease lubrication, including wheel bearings

SHELL RIMULA OIL

SHELL

Fast, economical handling of steel...



Twin Disc Model CF Torque Converter, as applied to the Model SC-50 Gerlinger Carrier, shown above.

with Twin Disc Torque Converter-Equipped Gerlinger Carriers

For faster, more economical handling of steel, a leading Midwest steel company depends on two Model SC-50 Gerlinger Carriers, both equipped with Twin Disc Model CF Torque Converters.

These 50,000 lb. working capacity carriers are presently stockpiling steel from the mill to the stockyard. The company also plans to haul coiled sheet from their rolling mill to the production plant, and in this operation the carriers will replace gondolas on the railroad.

The Twin Disc Converters provide a *smooth, steady, flexible* flow of power from 180 horsepower Hercules RXLDH engines, to the carriers. Through the exclusive Twin Disc Three-Stage design, the converter multiplies engine output torque up to *six times*—consequently, harmful, costly engine lugging and stalling are eliminated. Through *fluid* connection, overloads, shock loads and vibrations are cushioned *out*—which means longer life, and less maintenance on *both* driving and driven equipment.

In addition, the torque converter permits delicate "inching" of material into place without jerking. It also enables the carrier to do a smoother, easier job of spotting the load, and to maneuver in and out of tight places.

Today, Twin Disc offers *the most complete—the most versatile* line of torque converters available — both single-stage and three-stage—for all internal combustion engine applications from 30 to 1000 horsepower.

For complete information, consult Twin Disc *Specialists* — request *Single-Stage* Bulletin 508, or *Three-Stage* Bulletin 135-E.

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TWIN DISC CLUTCH COMPANY, Racine, Wisconsin • HYDRAULIC DIVISION, Rockford, Illinois

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ENGINEER'S FIELD REPORT

PRODUCT RPM DELO OIL RR

NORTHERN PACIFIC RAILWAY

FIRM South Tacoma, Wash.

RR diesel gears show only ½° wear in 2½ million miles

Timing gears on this Northern Pacific GMC-diesel locomotive engine, lubricated with RPM DELO Oil RR, recently completed 2½ million miles of severe freight service without repairs or adjustment. NP's South Tacoma Shop Foreman, A. R. Genin (above), indicates degree marks on engine flywheel, used to gauge gear wear. Tolerance between gear teeth shows variance of just ½° from original setting. Mr. Genin says, "We consider this low rate of wear remarkable for heavy-duty freight operation. It is typical of our experience during the 12 years we have used RPM DELO Oil in all our locomotive diesels." Engines are 1350 h.p. 16-567 series.

Why RPM DELO Oil RR reduces wear, corrosion

• Oil stays on engine parts—hot or cold, running or idle • Anti-oxidant resists lacquer formation • Detergent keeps parts clean • Special compounds prevent corrosion of bearing metals • Inhibitor resists foaming.

For More Information about RPM DELO Oils or other petroleum products of any kind, or the name and address of your nearest distributor, write or call any of the companies listed below.

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TRADEMARK "RPM DELO" AND DESIGN REG. U. S. PAT. OFF.

STANDARD OIL COMPANY OF CALIFORNIA, San Francisco 20

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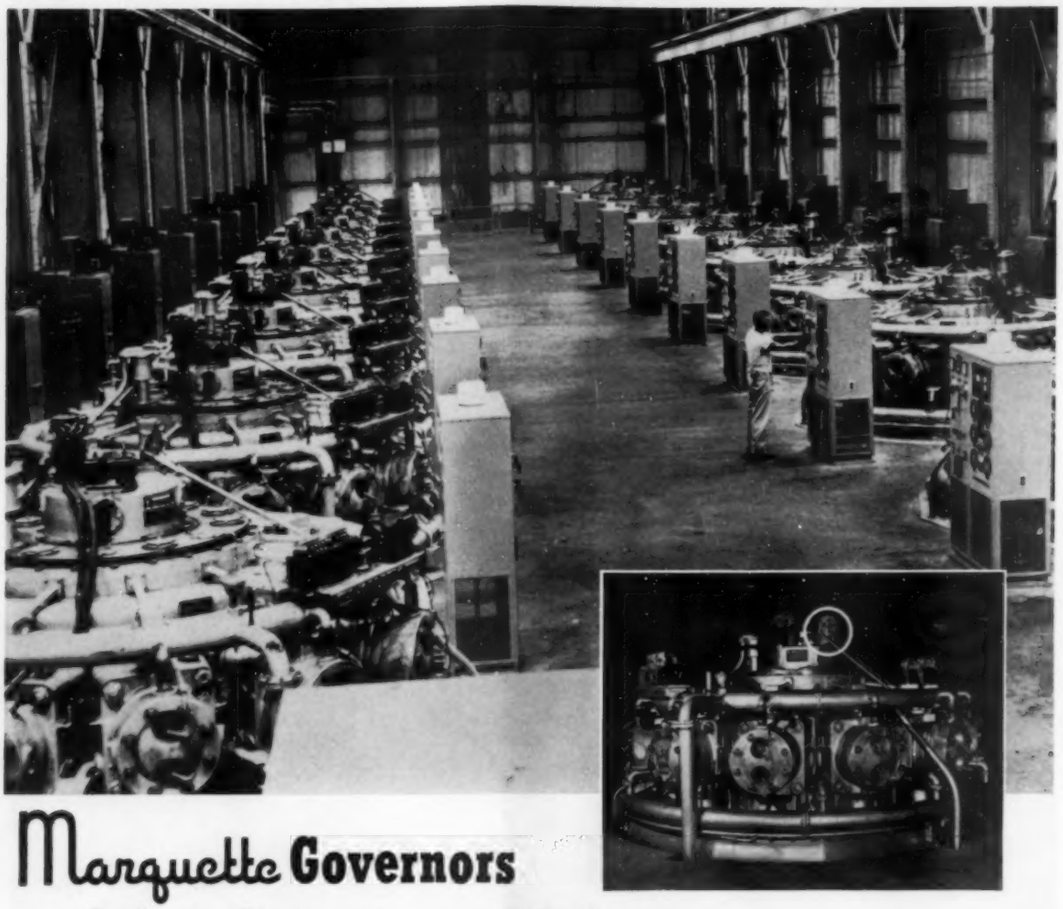


Marquette Governors
help to keep power costs down for ALCOA SMELTING WORKS

In the power houses of Aluminum Company of America's reduction plant at Point Comfort, Tex., 220 Nordberg spark-ignition radial engines generate electricity at a cost comparable to hydro-electric power sources. Important factors in this economical power production are Marquette Governors, which provide accurate speed regulation for many of the Nordberg Radials. Seventy-four of these engines equipped with Marquette Governors have been in service for this massive smelting works since 1952 . . . twenty-six are of recent installation . . . and twenty-two more are on order.

Take advantage of Marquette's engineering facilities for solving *your* problems of power control—on land or sea.

Other Marquette Products: AIRCRAFT WINDSHIELD WIPERS • PRECISIONSPRING CLUTCHES • ANTI-FRICTION BEARING TEXTILE SPINDLES • PRECISION PARTS AND ASSEMBLIES • ROTARY OIL PUMPS

MARQUETTE METAL PRODUCTS DIVISION
CURTISS-WRIGHT
CORPORATION • CLEVELAND 10, OHIO

Engines for this fast new fireboat are protected by Purolator filters

Diesels on Baltimore's powerful new fireboat easily push it along at a snappy 17 mph while it discharges 12,000 gallons of water every minute. But if dirt brought in by even the cleanest fuel supply should ever get into the engines, this outstanding speed and power would quickly suffer . . . and expensive repairs would follow. That's why Purolator fuel and by-pass lube filters are included as original equipment on all engines in the ship.

It pays for you to use Purolator filters in your diesel lube systems, fuel lines and fuel injection system. And you can't improve on Purolator Micronic® filtration because the micronic element is made of plastic-impregnated cellulose which makes it waterproof, warp-proof and unaffected by engine temperatures or crankcase dilution. It filters particles so small they can be measured only in microns – .000039 inch.

Filtration For Every Known Fluid

PUROLATOR

PRODUCTS, INC.

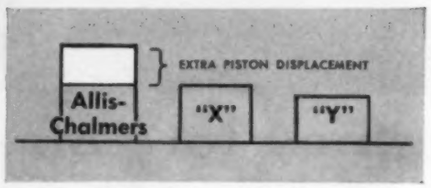
Rahway, New Jersey and Toronto, Ontario, Canada

ALLIS-CHALMERS DIESELS OFFER

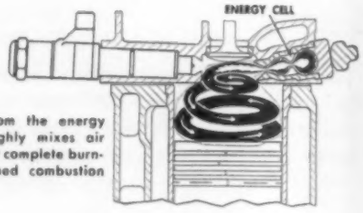
more USABLE power for your equipment

more PROFIT for you

You have a new kind of engine performance with Allis-Chalmers diesels. Their big piston displacement gives you greater reserve power, higher usable torque in the normal operating range. Their unique "follow-through" combustion results in highly efficient burning — builds up compression pressure slowly, sustains it over a longer period. Result: more *usable* power.



Allis-Chalmers' big piston displacement gives you extra usable power.



A blast from the energy cell thoroughly mixes air and fuel for complete burning, sustained combustion pressures.

Equipment must be *working* to be *earning* — Allis-Chalmers engines earn more because they are on the job working more. Rugged, simple construction, with fewer parts, means a minimum of maintenance. Get the complete story of why Allis-Chalmers engines give you more usable power, more profit. See your Allis-Chalmers engine dealer.

ALLIS-CHALMERS, BUDA DIVISION, MILWAUKEE 1, WISCONSIN

ALLIS-CHALMERS

BE-9A

Ross Exchangers cool this Superior Diesel Generating Set

Giant gate cranes and hoists are hard at work on the Long Sault Dam at Massena, N. Y., a part of the tremendous St. Lawrence Power Project. Supplying the power for these machines during construction, and scheduled for standby service after completion is this Superior 500 KW Model 40 Diesel Generator Set.

To maintain correct operating temperatures at all times, two Ross Exchangers have been furnished. One cools the lube oil. The other cools the jacket water. *Overheating is prevented and dependable performance thus assured.*

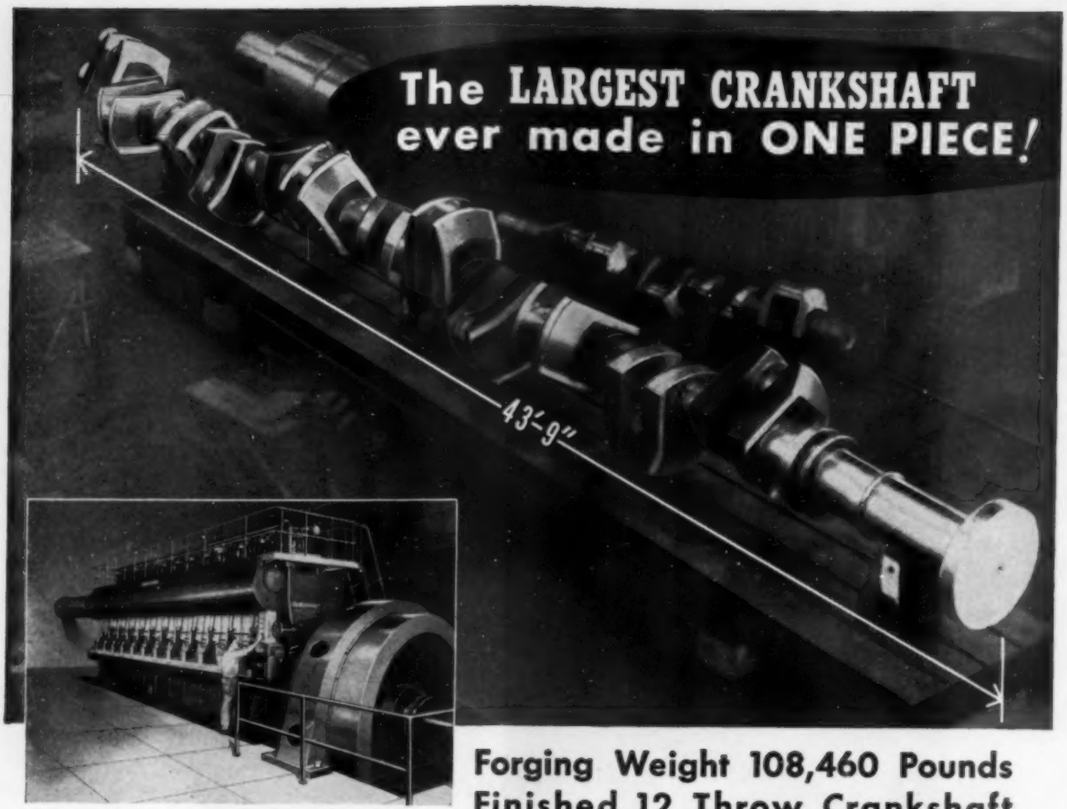
Testifying to the ruggedness and thermal efficiency of Ross Exchangers, the White Diesel Engine Division reports: "Ross Exchangers are used on our Superior Model 40 Engine . . . We are marketing a high quality product, and expect any component which we furnish to be of the same high quality."

You'll find Ross Exchangers serving practically all makes of engines, compressors and turbines. Pre-engineered and fully standardized, they're available in a wide variety of designs and sizes to answer your needs.

For more information, request Bulletins 1.1K5 and 2.2K1. Ross Heat Exchanger Division of American-Standard, Buffalo 5, N. Y. In Canada: American-Standard Products (Canada) Limited, Toronto 5, Ont.

ROSS HEAT EXCHANGER

Division of AMERICAN-Standard



The crankshaft harnesses 6190 horsepower developed by this Nordberg 12 cylinder Diesel engine to generate 4840 gross kilowatts of electric power.

Forging Weight 108,460 Pounds
Finished 12 Throw Crankshaft
46,400 Pounds

FROM a giant 210,000 pound, 72 inch ingot, poured at Erie Forge & Steel, came this 12 throw crankshaft . . . the largest ever made.

Within our plant this giant was machined down to 46,400 pounds fighting weight; the finished crankshaft is 43 feet 9 inches long by 15½ inches journal diameter. Bearing surfaces are polished to a mirror finish.

It is one of many such forgings followed step by step from raw material to shipping dock within the Erie Forge & Steel Corporation's plants.

Another convincing proof of the way "One Responsibility and One Control" at Erie Forge & Steel can work for you to your specifications for steel forgings and castings.

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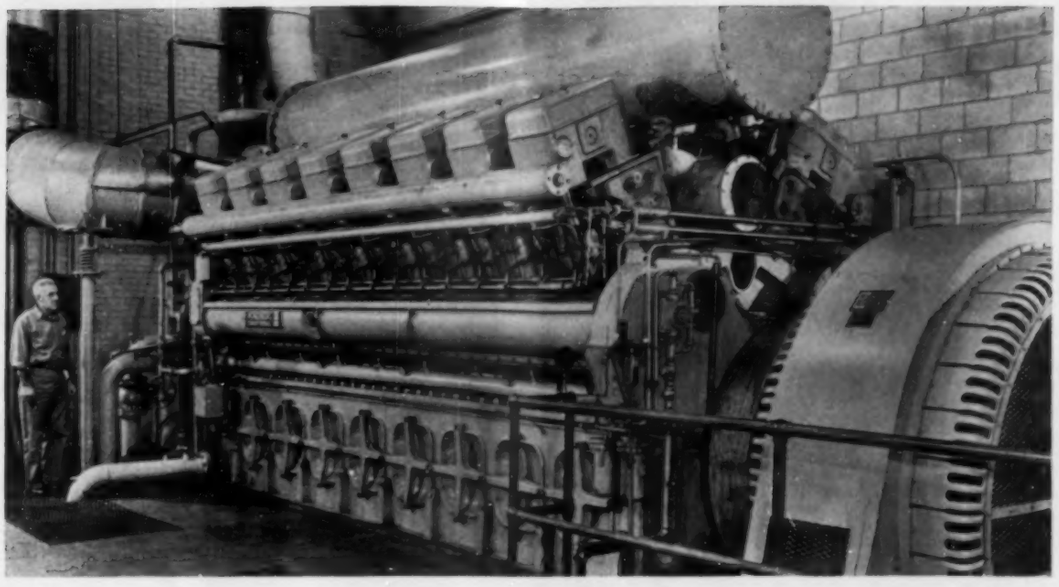

Woodstock, Illinois, keeps power flowing with

NORDBERG DUAFUEL® ENGINE EQUIPPED WITH BENDIX FUEL INJECTION

With a completely independent electric power system, the town of Woodstock, Illinois, takes no chances on power failures. That's why the city fathers recently purchased a Nordberg Supairthermal® Duafuel engine to supplement existing steam turbine equipment. The engine, like many built by Nordberg, is equipped with Bendix* Fuel Injection pumps.

Originally intended as a stand-by unit, the Nordberg engine has more than fulfilled its purpose. So efficient has it proved that it has frequently been used as a base load unit. Far from being relegated to emergency use only, it has seen more and more regular service, and its moderate fuel consumption makes it the most economical unit in the plant, especially for short peaking purposes.

Citizens of Woodstock are happy with their independent power system. They like the revenue it brings in to support their city government (revenue that the new Bendix-equipped Nordberg engine is helping to increase), and, more than that, they like the uninterrupted service, regardless of weather. Bendix is pleased that its fuel injection system used on the Nordberg engine is helping keep this progressive Illinois city supplied with dependable power at reasonable prices. *REG. U.S. PAT. OFF.

SCINTILLA DIVISION OF BENDIX AVIATION CORPORATION, SIDNEY, N. Y.
Export Sales and Service: Bendix International Division, 205 East 42nd St., New York 17, N.Y.

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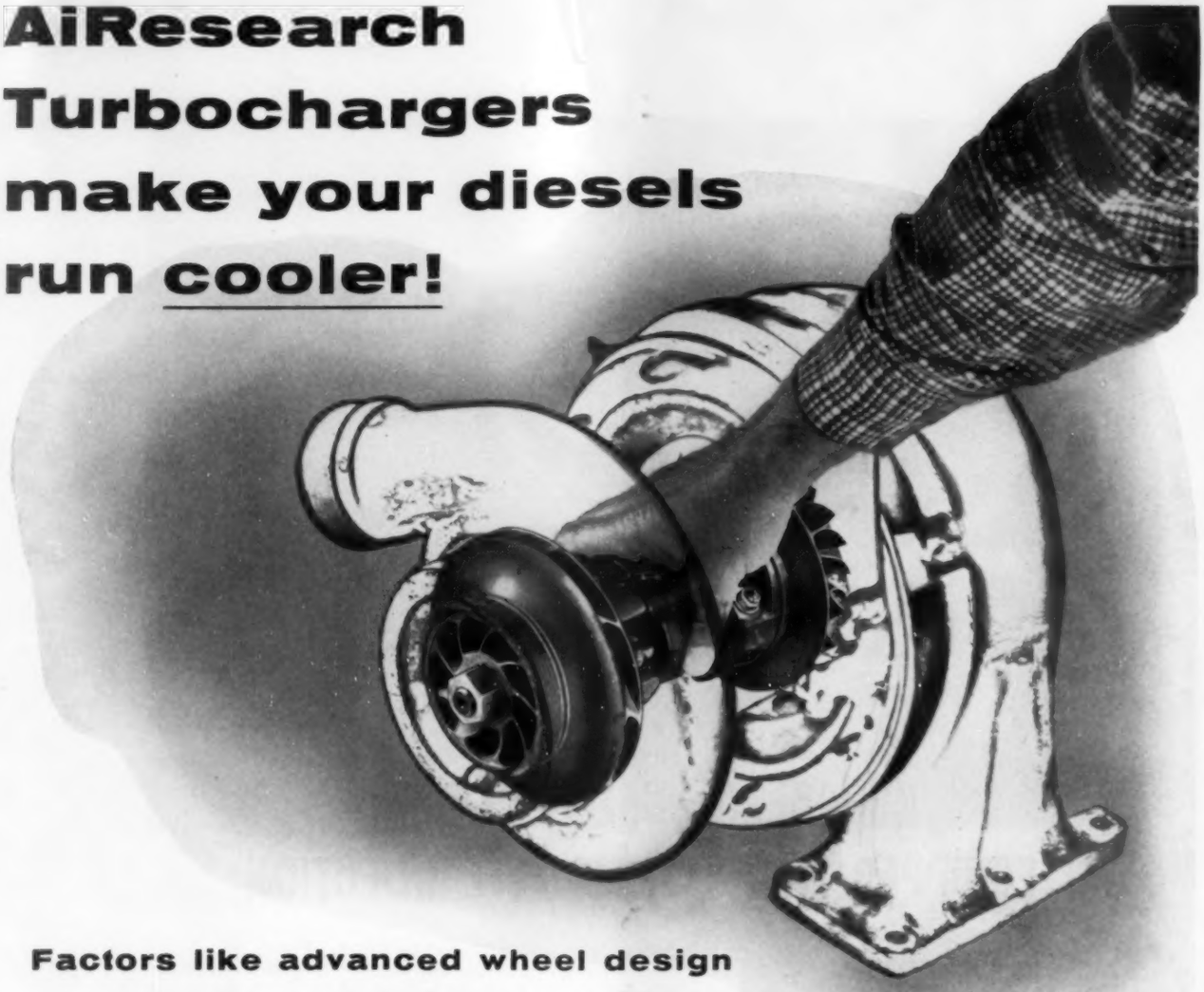
AVIATION CORPORATION

AiResearch Turbochargers make your diesels run cooler!



Factors like advanced wheel design and perfectly matched turbine and compressor keep engine thermal loading at a minimum

So effective is the AiResearch turbocharger that it provides power gains while actually lowering the heat level of the engine.

Ambient air is compressed with an efficiency as high as 82%, feeding a maximum weight of air into the cylinders at the lowest possible temperature.

Results: maximum power gain at minimum fuel cost; complete combustion with elimination of objectionable smoking; low engine thermal loading insuring long, trouble-free operation.

All AiResearch turbochargers are air cooled, placing no added burden on the diesel cooling system and requiring no complicated plumbing. The rotating assembly is removable as a unit, simplifying in-the-field maintenance. This advanced design evolved from the most extensive experience in the field of small turbomachinery in America.

Your inquiries are invited.

BASIC SPECIFICATIONS FOR AIRESEARCH TURBOCHARGERS

MODEL	F-51	C-60	A-60	E-100	B-100
Diameter — in. nom.	9	11.5	15.25	15.25	16
Length — in.	9	14.12	16.75	17.25	21.75
Weight — lb.	40	95	125	135	195
Output — lb/min. (Standard Conditions)	25-40	35-65	35-65	70-95	115-175

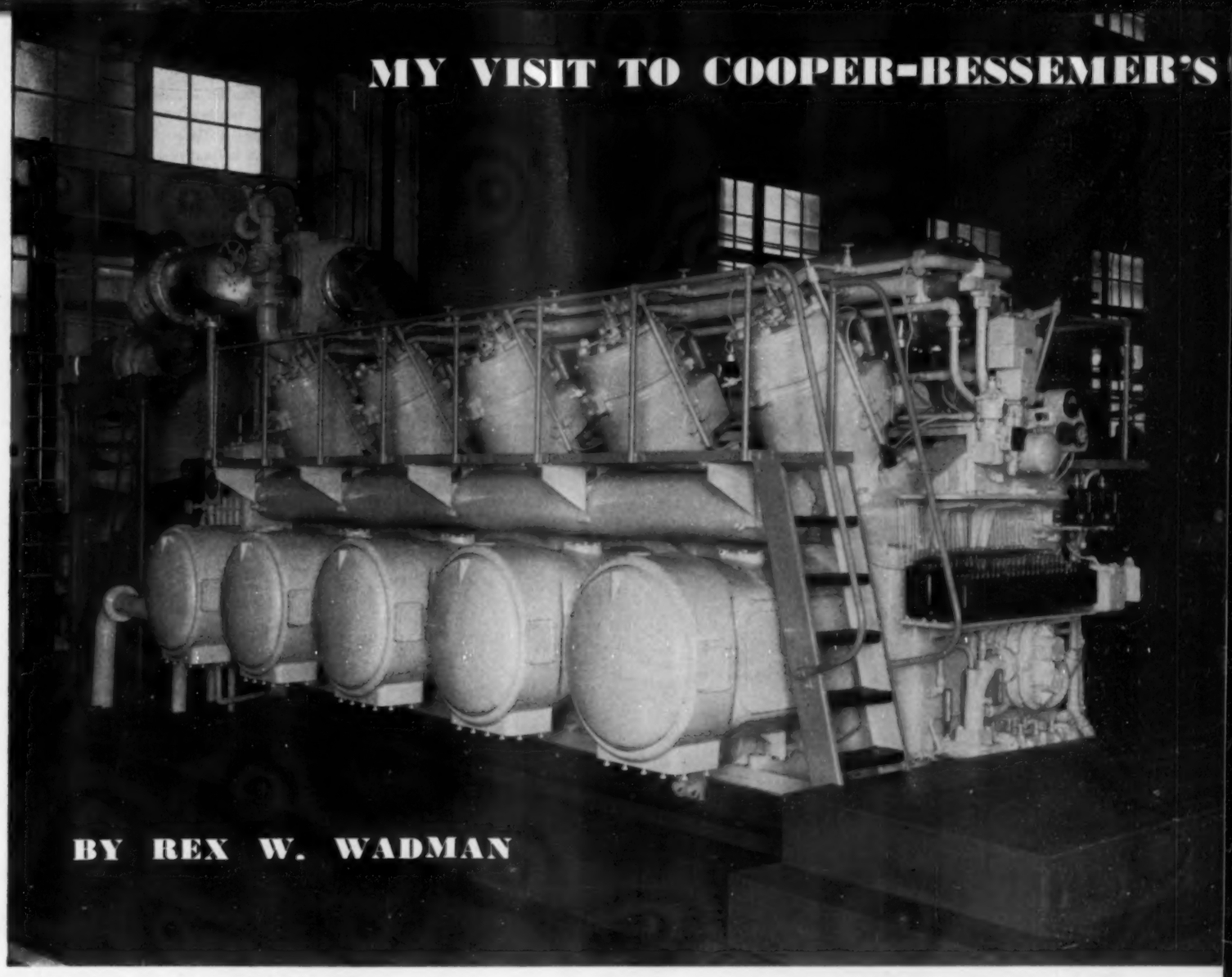
THE GARRETT CORPORATION

AiResearch Industrial Division

9225 South Aviation Blvd., Los Angeles 45, California

DESIGNERS AND MANUFACTURERS OF TURBOCHARGERS AND SPECIALIZED INDUSTRIAL PRODUCTS

MY VISIT TO COOPER-BESSEMER'S



BY REX W. WADMAN

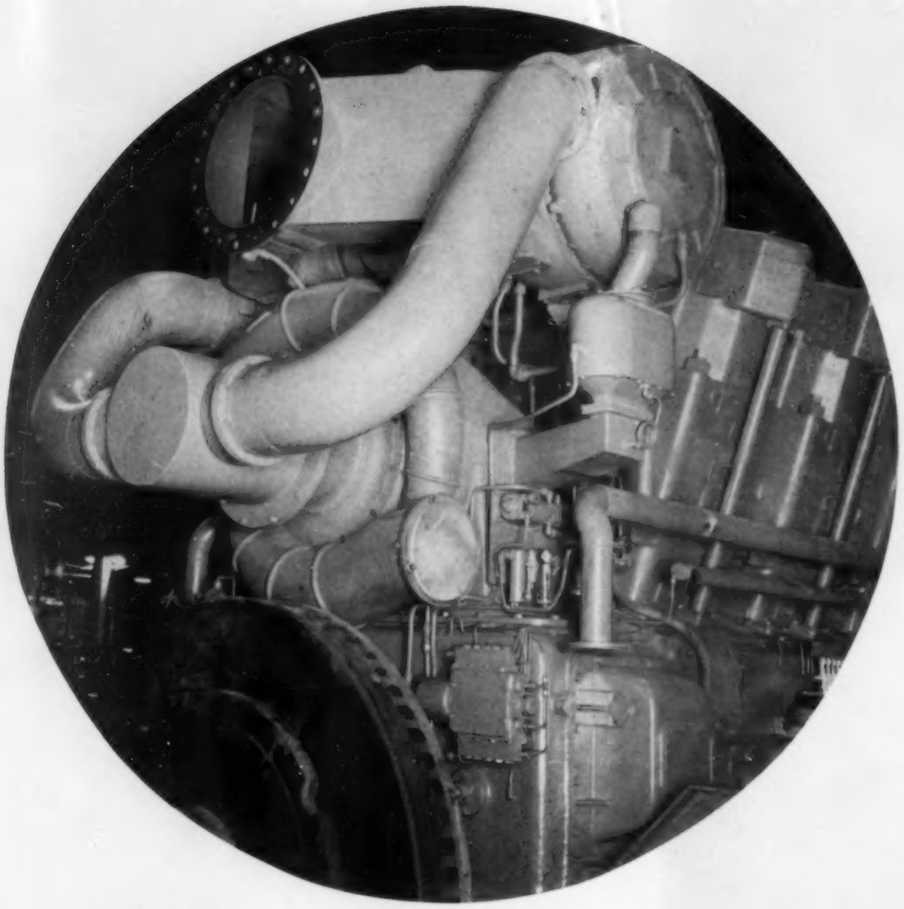
Compressor side from operating end of series turbocharged type GMVC 10-cylinder engine on test in the Mount Vernon plant. Engine is rated 1800 bhp at 300 rpm. Note the duplex Manzel lubricator on the front end above the Pickering over speed governor and immediately above it the Woodward isochronous governor. To the right is the Alnor pyrometer.

MOUNT Vernon, Ohio. February 14th. I flew in here this morning from Los Angeles and I'm flying back to my California office tonight. I'm very glad I came. Here I have met some of the outstanding business paper editors in these United States—men who have contributed a large part of the success currently attending their respective magazines. As you, my readers, know, I have maintained for a great many years that a business paper is only as good, only as valuable as its editor and his editorial staff's experience and standing with their readers.

President L. F. Williams of the Cooper-Bessemer Corporation, was good enough to include me in his invitation to the editors of the key magazines reaching the markets of interest to them. In his letter of invitation he stated, "The phenomenal growth in the economy of our country has focused wide attention on the more efficient generation of power. Considering the prominent role that Cooper-Bessemer plays in the power industry, we are planning a conference here at Mount Vernon on Thursday, February 14th. Ralph Boyer, our vice president and chief engineer, will present the power story, illustrating our most recent power-producing developments. This will be followed by demonstrations of our latest development."

Now, Mr. Williams' words turned out to be a mild understatment of the very interesting day that we editors have spent here at Mount Vernon. To begin with, Mr. Boyer talked to us by word, by graphs, by slides for nearly two hours, every minute of which brought us important new information. Then we went out into the shops and saw the new engine or group of engines which I will talk about in more detail later, in addition to which, we saw many of the new products now produced and sold by Cooper-Bessemer, indicating a wide diversification in their manufacturing and marketing program, which possibly accounts for the fine record the company made in 1956 as indicated by the pyrotechnical rise in the price of their stock.

The principal reason for our coming out here today was to see the series turbocharging of Cooper-Bessemer V-angle compressors. To help clarify the development and ultimate possibilities of series turbocharging, I would first like to review briefly the steps that initiated this engineering accomplishment. The turbocharging of internal combustion engines is a means of converting waste heat normally exhausted from the engine to useful horsepower. For many years, engine builders have been developing the use of turbocharging to attain three economic objectives . . . namely obtaining more power from the same size engine, improving fuel economy, and lowering the installation and maintenance costs. Turbocharging itself actually dates back as far as 1934 for heavy-duty 4-cycle engines and to 1951 for heavy-duty 2-cycle engines. Out of considerable development work have come numerous engineering accomplishments, one of which is the highly efficient spark-ignited turbocharged gas engine. An example, for instance, of such an accomplishment is the installation of

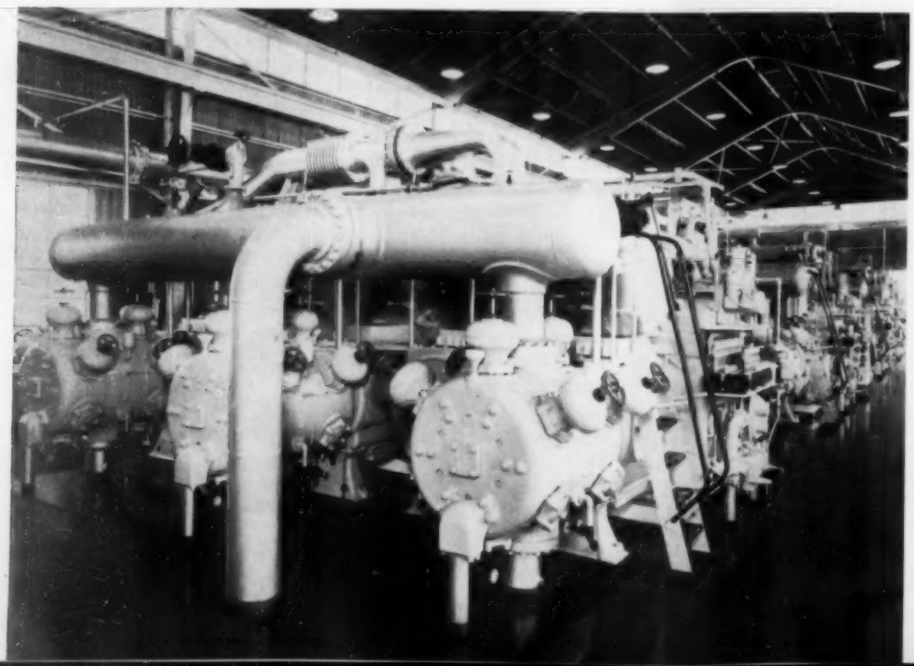


Series turbochargers mounted on flywheel end of GMWC engine-driven compressor. Engine develops 3500 hp at 250 rpm.

forty-two 3700 hp type LSV Cooper-Bessemer engines at Reynold's Metals' aluminum reduction plant, at Corpus Christi, Texas, which I described in the July, 1952 issue of DIESEL PROGRESS. Years of continual, heavy service confirm the remarkably low costs originally predicted in generating power with turbocharged engines.

One of the first 2-cycle engines to be equipped with the all-exhaust driven turbocharger was put into full operation for the Tennessee Gas Transmission Company. This was late 1953 at Cambridge, Ohio. The engine was a Cooper-Bessemer type GMV unit. Although normally rated at 1100 hp, this engine was increased in output to 1350 hp. This same engine has actually pulled as high as 1500 hp on gas transmission service.

Cambridge Station of Tennessee Gas Transmission Corp., completely turbocharged installation of 8 Cooper-Bessemer type GMV engine-driven compressors.



Along with exhaust-driven turbocharging, development work had also been going on to boost the horsepower of 2-cycle engines with other methods such as mechanically driven blowers. Today, a number of 2-cycle engines utilizing mechanically-driven blowers are in service. In view of certain desirable characteristics found in the all-exhaust turbocharger and in the mechanically driven blower system, it was only logical that an attempt be made to combine the inherent advantages of two systems. These advantages are the ability to be completely self-starting and to sustain operation under partial load conditions. This means that there are no mechanical devices to disengage after the engine starts up. Since most engines do not operate at full load 100% of the time, the ability of the series turbocharging system to sustain operation over partial loads is of major importance.

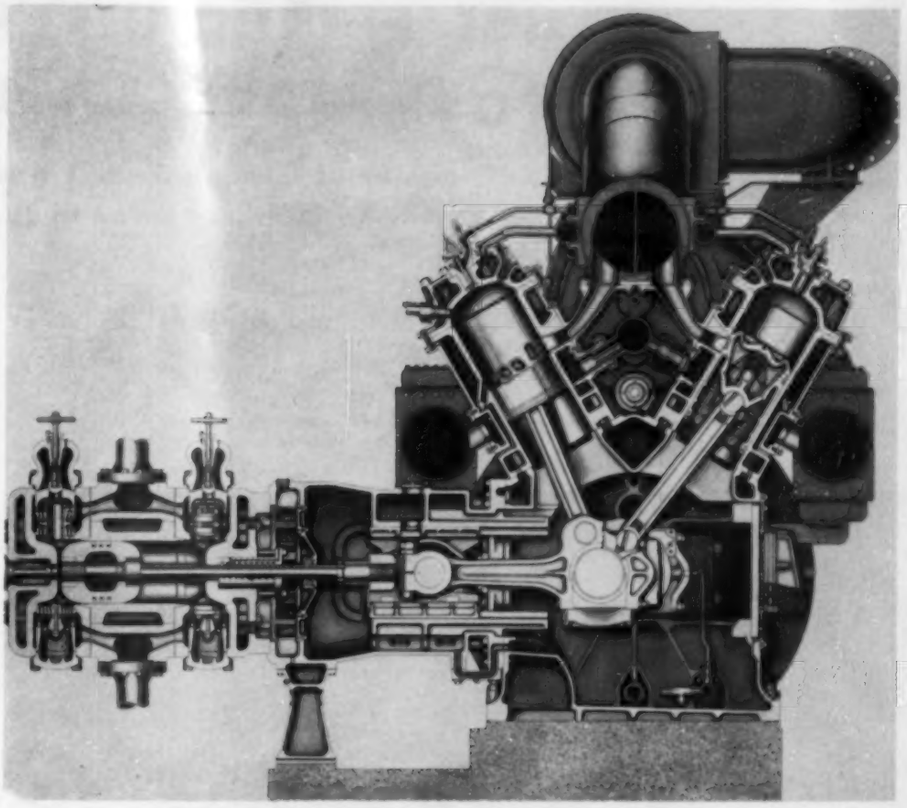
Compared with 2-cycle engines of nine years ago, series turbocharging has nearly doubled the horsepower output for the same bore, stroke and speed of the engine. Compared with more recent engines, horsepowers have been increased nearly 40%. Fuel economies as low as 6900 btu per brake horsepower hour can now be guaranteed for larger engines. Prior to this time, all internal combustion engines have had to be derated in horsepower output when installed at elevations above 1500 feet.The reason was simple. Above this altitude, there is insufficient air to burn all the fuel the engine was capable of handling. With the series turbocharging system, 2-cycle engines can now perform efficiently at altitudes up to 7500 feet without any loss in horsepower. Since a number of power stations today operate at the higher altitudes, engines with the series turbocharging system enable the operators to get the same horsepower rating as at sea level. The ability of series turbocharging to increase horsepower output of the engine without increasing engine size offers promising opportunities in cutting station costs. Since each engine can now put out more power, fewer engines will be needed. Consequently, fewer foundations, less station piping and space will be necessary. With fewer engines, supervision and maintenance will be lower.

The illustrations on these two pages will give you a good idea of how compact this system of series turbocharging is, but I want to take you, for a moment, over the follow-through. Intake air for scavenging burnt gases from the cylinder is first compressed by a turbocharger. This turbocharger is powered by a gas turbine which is driven by exhaust gases coming from the engine. The initially compressed air is then directed through a mechanically-driven blower for a second stage of compression. The intake air is then delivered through aftercoolers to reduce temperature before the air enters the engine. In the development of this series turbocharging system, a fundamental need for closely matching the characteristics of the turbocharger with the demands of the engines became

evident. Only through precise refinements in turbocharger design could it become possible to attain the ultimates in potential fuel efficiency as well as freedom from surge at all engine loads and engine speeds. As might be expected, complexities such as the effects on operating characteristics resulting from manifold had to be considered. Similarly, effects of centrifugal wheel design and after-cooling had to be researched in minute detail. Judging by actual experience with series turbocharged engines now in service, the combination of the exhaust-driven turbocharger with the mechanically-driven blower, I believe to be a very effective system for increasing the output and the fuel economy of 2-cycle engines.

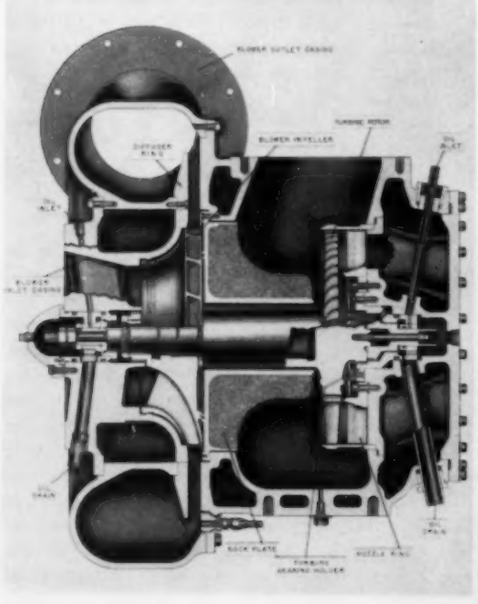
Before I leave here tonight, I want to get over to you two things which hit me squarely between the eyes today: The 10-cylinder 14x14 Cooper-Bessemer V-angle unit, which used to be rated at 1100 hp, now with series turbocharging these V-angle units produce 1800 hp. The same proportionate increase in power per engine is applicable to the big 18x20 in. series turbocharged V-angle Cooper-Bessemer. The other outstanding achievement, in my opinion, is that the overall thermal efficiency of these engines is now in excess of 40%—which is a real achievement.

As you all know, hot air expands and cold air contracts. The engineer's dream is to get as much reasonably cold air into a cylinder as he can. The use of a pair of Young Radiator heat exchangers, so noticeable in the illustrations on this page (see both engine cross sections) does a marvelous job of reducing the temperature of the air coming from the final turbocharging series before it enters the engine, to a point where you can comfortably hold your hand on the air intake manifold. This is one explanation of why these series turbocharged V-angle compressors are working so well out in the field and are producing so much more power than practically the same engine did before series turbocharging became an accepted solution of the problem of installing fewer engines in less space yet producing the volume of power required by the station. I say again that this has been a day well spent. Not only have I enjoyed meeting so many of the outstanding technical trade paper editors, but I've learned a lot. I'm trying to pass some of it on to you.

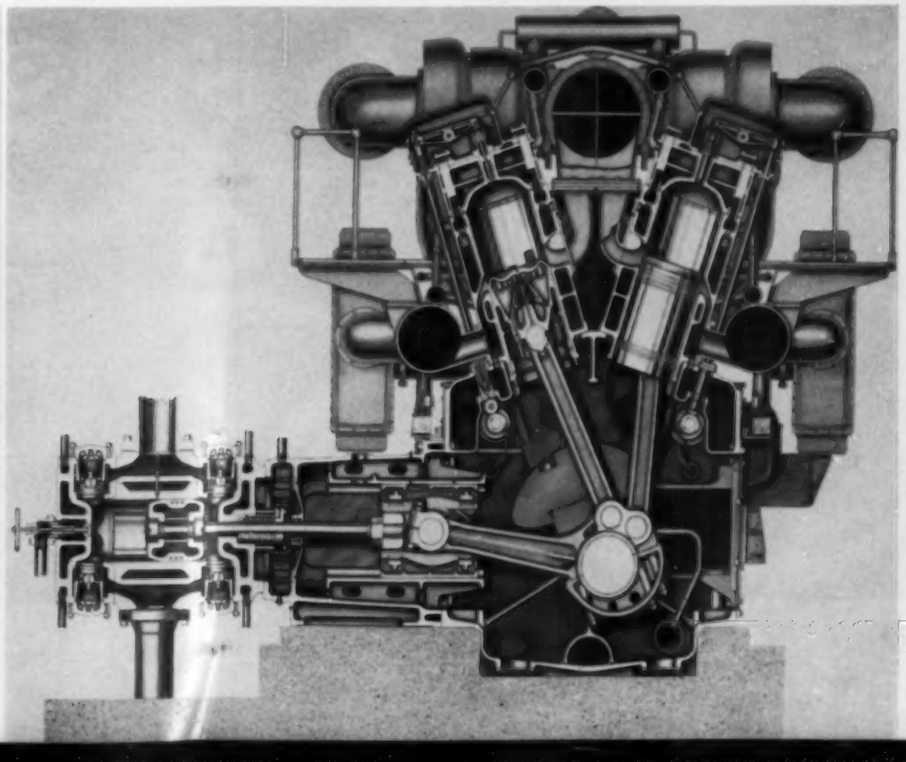


Cross-section view of series turbocharged type GMVC-10 cylinder engine.

Cross-section of ET-13 exhaust-driven turbocharger for increasing the power of four-cycle locomotive engines.



Cross-section of Cooper-Bessemer series turbocharged 10-cylinder GMWC V-angle compressor rated 3500 bhp at 250 rpm. The two Young Radiator intercoolers show immediately under platform on each side of the engine.

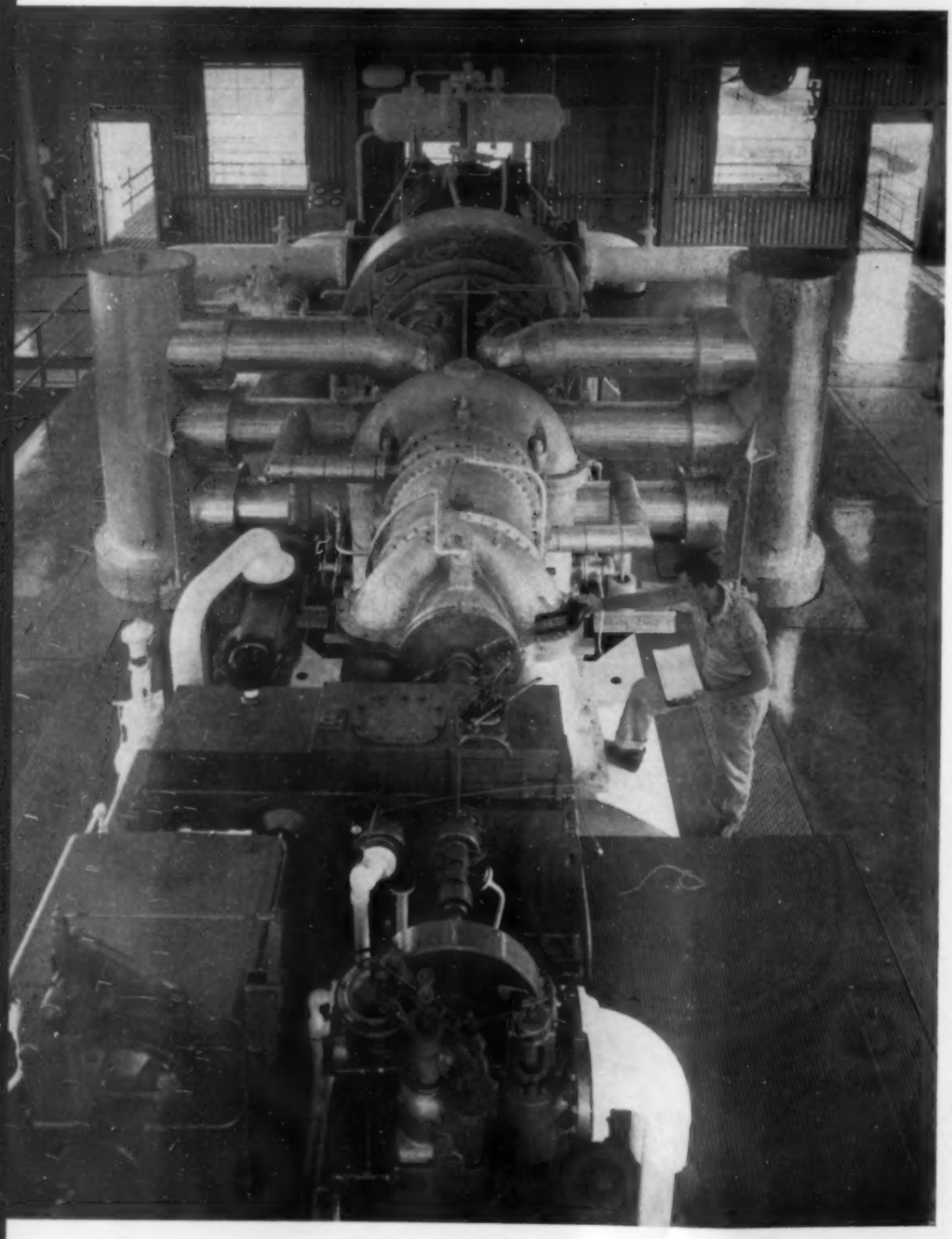


GYROL FLUID DRIVES USED AS SPEED REGULATORS

Trunkline Gas Company of Houston Uses Three American Blower Gyrol Fluid Drives To Regulate Speed of Plant Generators.

By J. W. BROWN

This view of the Kountze, Texas pumping station of the Trunkline Gas Company shows the American Blower Company Gyrol Fluid Drive in the left foreground. The generator itself does not show in this picture.



IN July 1956 DIESEL PROGRESS published a description of the American Blower Company's Gyrol Fluid drives and mentioned how this method of transmitting power can be used, in connection with governor control, to regulate within close limits the speed of driven machinery. We now can report three separate installations owned by the Trunkline Gas Company of Houston, Texas which demonstrate clearly the way this operates in actual use. For those who may have missed the previous article, a short resume of the principles involved may be in order. Illustration No. 1 shows how the Gyrol drive works. The input shaft, impeller and casings rotate together at input speed. The output shaft and the runner rotate together at output speed. There is no mechanical connection between the input and output members. Power is smoothly transmitted from the impeller to the runner by a vortex of oil. The output speed is adjusted by regulating the amount of oil in this working vortex.

Oil entering the working circuit is acted upon by centrifugal force and takes the form of an annular ring in the working circuit and scoop tube chamber. The scoop tubes are positioned by the external speed control lever to set the level of oil in the scoop tube chamber. This in turn determines the amount of oil in the working circuit and, therefore, the output speed of the fluid drive. Smooth, stepless control over a wide speed range is available. Position of the scoop tube is regulated manually (through linkage and a push-pull control rod) or by a governor which is geared to the output shaft of the fluid drive. Since in this case the goal was close speed regulation of a driven generator, the governor-controlled type of Gyrol drive was chosen.

DIESEL PROGRESS last July reported some possibilities of this type of drive in operating diesel-driven slush pumps in the oil fields, other kinds of pumping equipment, and in regulating the speed of accessory equipment such as generators under conditions of changing loads and/or under conditions of changing speeds on the part of the prime mover. Both sets of conditions—changing speeds on the power input shaft, and changing loads on the driven equipment are present in the Trunkline Gas Company installations. At their Edna, Kountze, and Premont, Texas stations, Trunkline Gas Company uses, in each instance, a Type VS Class 2 Special Gyrol drive to drive and

regulate in speed within very close limits a 1200 rpm, 400 volt, three phase 100 kw General Electric generator for plant use and to light the homes of several employees near the plant.

The prime mover in the three installations is in each case a G. E. 6,350 hp Gas Turbine used primarily to drive a centrifugal compressor to move gas through a pipeline. While in normal operation the speed of this turbine does not vary greatly, it could vary from 5,000 to 6,900 rpm. Step-down gears of approximately 3.88:1 and furnished by General Electric are used between the gas turbine and the generator, so the fluctuations in speed back of the gear box could range from 1800 rpm down to about 1300 rpm. Foreseeing that this would be unsuitable for a 1200 rpm generator drive, Trunkline Gas Company and the American Blower Company worked out the solution by installing the Gyrol Fluid drives to serve between the gear box and the generator as an adjustable speed regulating device.

Of course to the 6,350 hp gas turbines, the generators represent only a trifling accessory load, but since the load on the generators varies considerably, the Woodward governors which control the scoop tube position on the Gyrol Fluid drives assume somewhat the same relationship to the generators as would the governors on diesel generator set engines. They supply more torque when needed to carry the generator load, and keep the generators operating at the required speed. The first installation of these generator drives at Trunkline Gas Company was at the Edna station in the spring of 1955. The Kountze and Premont installations were made in January, 1956. After some preliminary work of characterizing the drives and controls to the specific job, there have been no maintenance problems and C. R. Carter, Superintendent of the pumping stations, expresses general satisfaction with their operation.

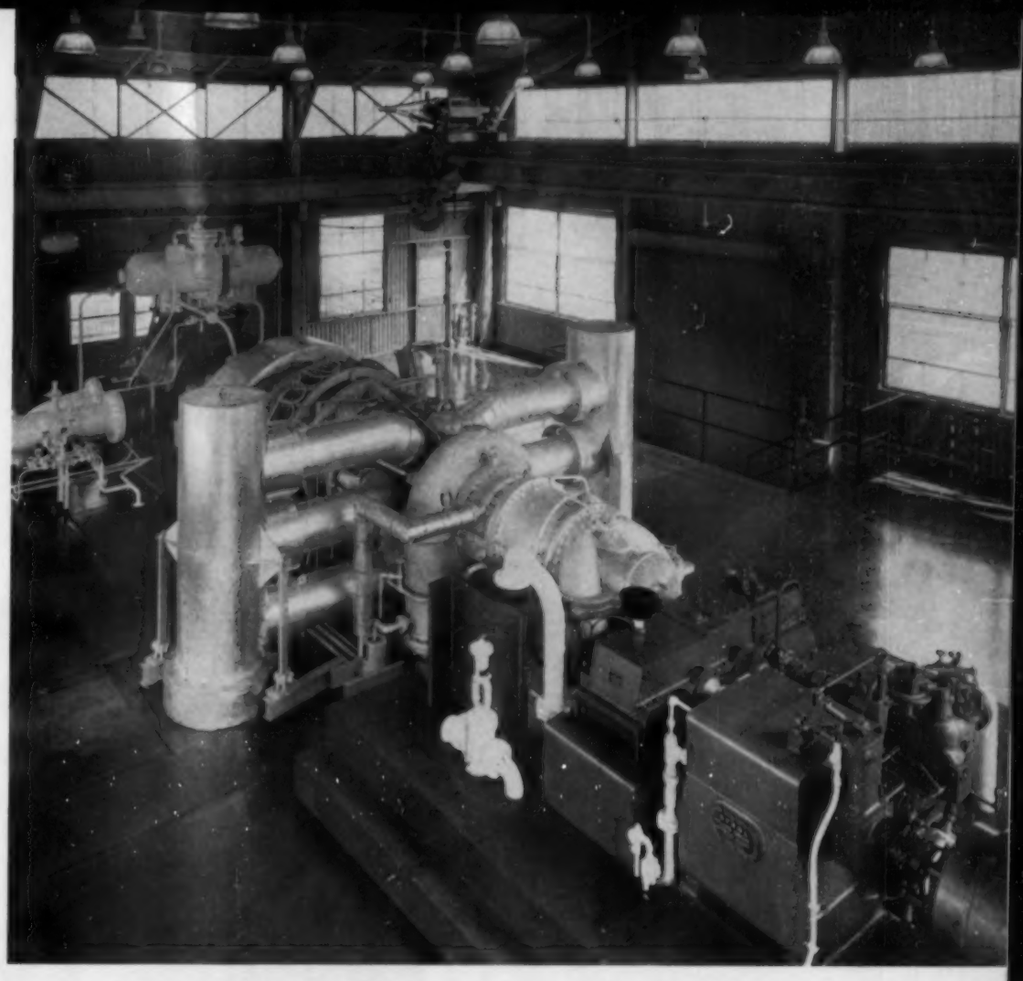


Photo of the Kountze, Texas, Trunkline Gas Company installation with the American Blower Company Gyrol Fluid Drive at lower right, just back of the gear box. Front end of the 100 kw, 440-volt generator barely shows in lower right-hand corner.

Output Shaft end of American Blower Company Type VS Class 2 Special Gyrol Fluid Drive with Woodward Governor as used in Trunkline Gas Company installations.

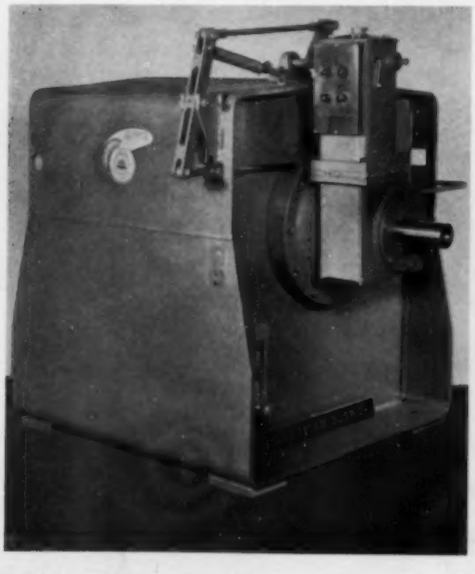
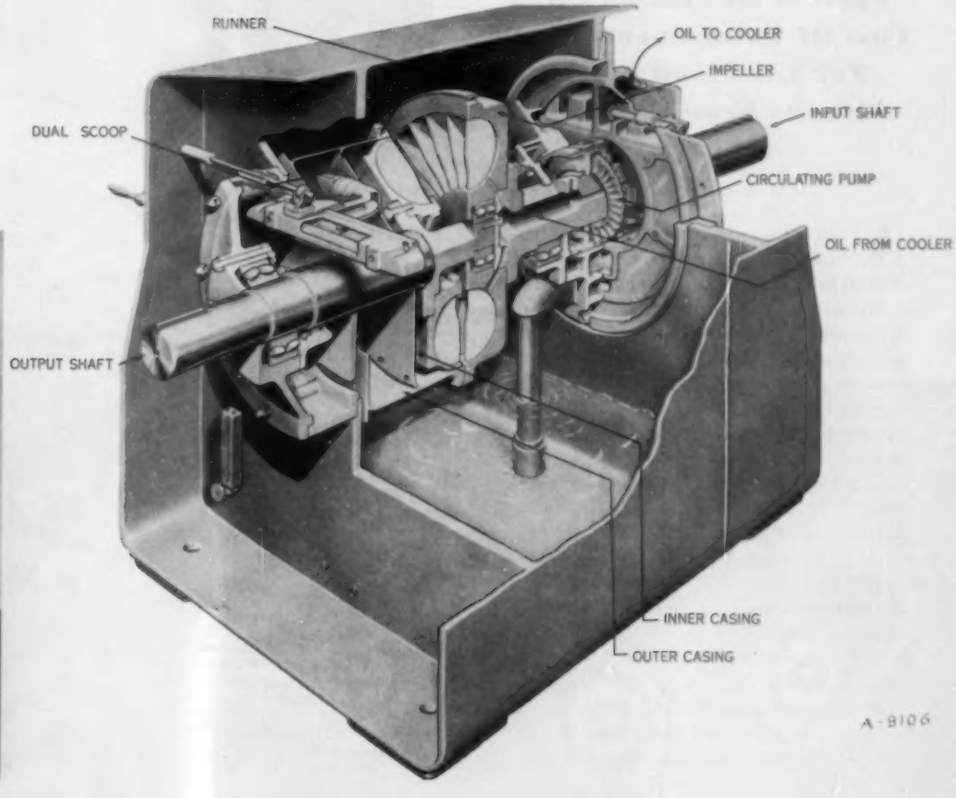
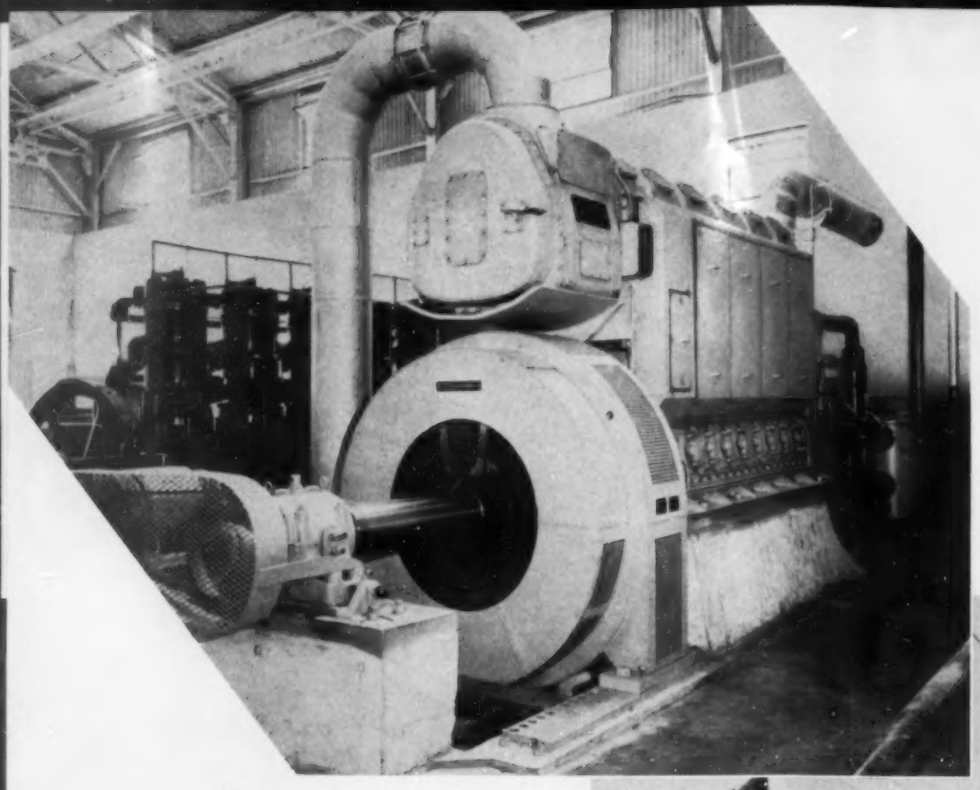


FIGURE 1. Cutaway view of Gyrol Fluid Drive.





Newest and most powerful of the city's diesels is this 1280-hp Fairbanks-Morse opposed-piston engine driving a 900 kw F-M alternator. It went to work in February 1955.

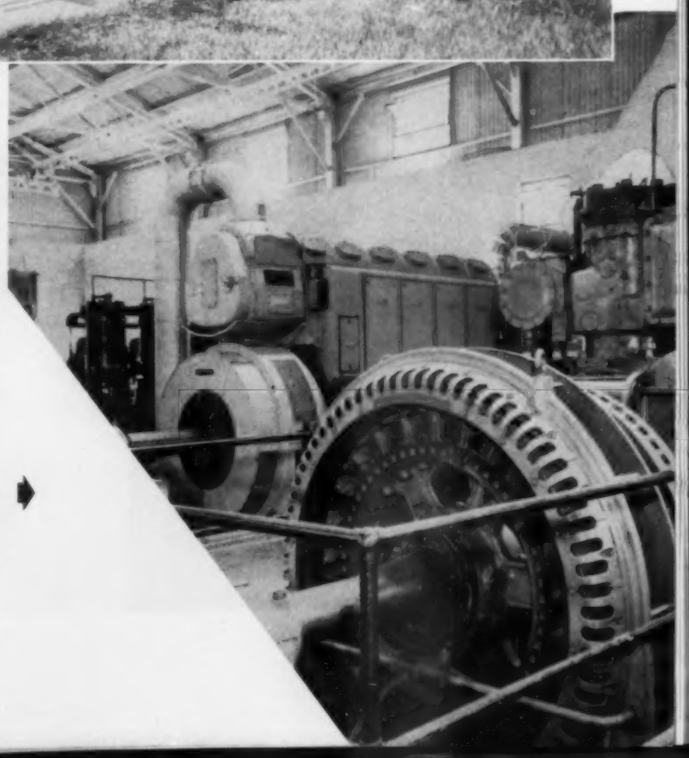
WAUCHULA, FLORIDA

Municipal Diesel Plant With Five Fairbanks-Morse Engines Carries 70 Percent Of Florida City's Cost Of Government, Easing Tax Load And Serving Citizens From Cradle To Grave.

A MODERN diesel power plant is paying the bulk of all costs of government for the City of Wauchula, Florida, out of the municipal utility's profits. At the same time, the plant has rendered unfailing service to consumers of electricity and has paid all its own operating and capital expansion costs out of its own revenues. Today, the plant represents an investment of more than $500,000.00 with five Fairbanks-Morse diesels totaling, 3,955 horsepower. Latest addition to meet the growing demand is a 1280-hp opposed-piston diesel which went into service in 1955. Wauchula enjoys the Florida climate but does not use it to attract tourists. Some 70 miles southeast of Tampa, Wauchula is the county seat of Hardee County, a solid, prosperous agricultural region growing citrus fruits, cucumbers, tomatoes, egg plant and other vegetables. This is a land of warm sun, rich soil and good rain which the farmers supplement with irrigation to get two crops a year. Wauchula, with population of 3,500, is the trading center of the region and also a processing center with six vegetable packers, a cannery, a feed mill and a crate factory, all dependent for power on the city's diesels.

Back in the twenties, Wauchula was not immune to the Florida land promotion fever and with hundreds of other communities in the state went through a painful boom and bust cycle. From that era the city emerged with a heritage of bonded indebtedness which still hangs heavy on the taxpayers' back. Today, every cent of the property taxes collected in Wauchula goes to pay interest on that ancient debt. If the citizens had to pay in addition the normal

The Wauchula, Florida municipal power plant blends its old brick with sheet metal and wooden pillars to present an attractive modern exterior. Housing five Fairbanks-Morse diesels, the plant produces power at a profit and pays a major part of the city's operating budget.



From right to left are four of Wauchula's five Fairbanks-Morse diesels: the 1200-hp engine installed in 1951, the 1280-hp unit that went into service in February 1955, the 360-hp diesel installed in 1932, and almost out of sight behind it the 300-hp engine that has served since 1925.

costs of government, the tax load would be a difficult burden. Fortunately, the city has its prosperous municipal utilities to bear a major portion of the costs. Thus, in 1955, Light and Water Department receipts amounted to $253,010.40 while actual expenditures of the department amounted to $131, 397.10, leaving a whopping $121,613.30 for support of other city services. In fact, the utilities' contribution amounted to 70 percent of the $173,269.98 spent for all other municipal expenses. Light and Water profits paid for the fire department, the police department, for paving and maintenance of streets, for sewage disposal and hauling away trash, for the city athletic park and the youth center tennis courts, for the library, for maintenance at the emergency airport, for inspection of meats, for trimming trees and cutting weeds, for street lights and the electricity they use, even for perpetual care of the graves in the city cemetery. Literally, from cradle to grave, power profits help pay the way. Without the diesels producing kilowatt-hours at a profit, taxes would have to be double or more.

The city was forced into production of electricity to meet the citizens' needs. Originally, the city purchased power from the local crate mill but growing demand outstripped the surplus capacity of the mill and in 1922 Wauchula installed two 200-hp Fairbanks-Morse semi-diesels in the old water works. At that time, peak loads ran up to 90 kilowatts. In 1925, the building was extended and a 300-hp Fairbanks-Morse diesel installed. This engine is still in service, the oldest unit now in the plant. Of the other four F-M diesels in service, the 360-hp unit was installed in 1932, the 805-hp engine in 1947, the 1200-hp unit in 1951, and the newest and most powerful engine—the 1280-hp opposed-piston diesel—in February 1955. From 90 kw the load has gone up to 1750 kw and continues to rise. The growth of the load is itself one indication of progressive management. A few years ago, the city decided to encourage the use of electric ranges, water heaters and other home appliances by offering free installation. The city bought the materials needed and paid a flat fee to the electricians with total cost averaging $33.90 an installation. In two years, about 350 stoves and water heaters went in and increased usage of electricity in a single year paid off the municipal investment. To this steady domestic load must be added the air conditioning and refrigeration load in the summer months and the industrial demand in spring and fall. Actually the highest peaks occur in March, April, October and November when the food packers are handling the crops. With all factors contributing to increased demand for electricity, the load threatened to outstrip the power plant. It took the installation of the new diesel in 1955 to restore firm capacity. Even now, if the new unit is out of service, every other engine in the plant (including the 31-year-old diesel) must be run near full capacity to carry the peak load. Anticipated continuation of load development will make it imperative to run the new engine to handle the peaks.

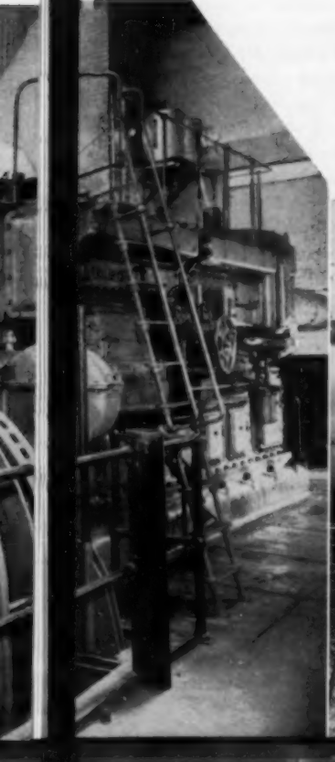
Installation of the opposed-piston diesel in February 1955 accomplished more than provision of needed capacity to carry the load—it raised substantially the efficiency level of the plant. Previously, it had been necessary to call on even the oldest engines for considerable production and the plant average hovered around 11.9 kilowatt-hours per gal. of fuel consumed. With the new engine in service and producing at the rate of 13.5 kw hrs per gal., total plant average is up to 12.46. It should be noted again that all new engines were financed with revenue bonds, paid wholly out of plant profits. The plant has always been profitable with profits growing as the consumption of electricity increased. The opposed-piston diesel is the base-load engine of the plant, operating from 6:30 a.m. to 10 p.m. every day but Sunday. Other units are added as needed to meet the load situation. The 805 hp engine normally handles the night duty.

The engine on which Wauchula places reliance is an 8-cylinder, 8⅛ by 10½-in., Fairbanks-Morse opposed-piston two-cycle diesel developing 1280 hp at 720 rpm. The compact prime mover and its 900 kw alternator sit high on the concrete foundation formerly occupied by a 375-hp Worthington diesel which served from 1938 to 1954. Care is taken to keep lubricating oil in top condition. The detergent-type lube is circulated under pressure through the engine, a full-flow filter and an oil cooler by an engine-driven pump. Some oil is bypassed from the pressure system through a multi-element cellulose-cartridge filter.

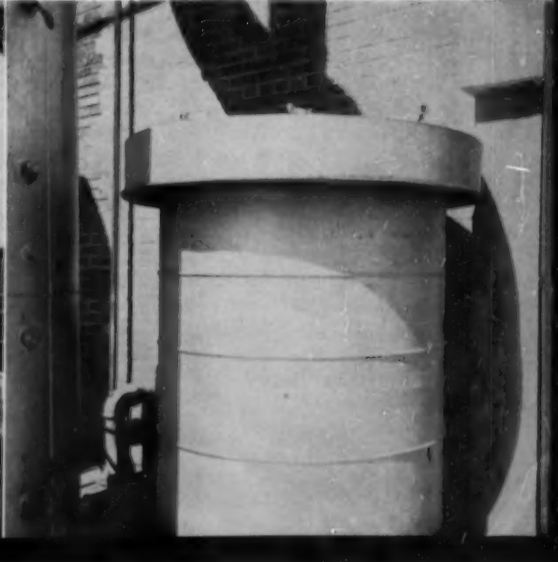
The first essential in power plant operation is unfailing service to the consumer. Wauchula doesn't remember exactly when the last outage occurred, but they know there hasn't been one in the past five years. A sound preventive maintenance program insures that the diesels will be fit to serve when needed. It is worth noting that in 1955, with five engines ranging in age from brand new to 30 years, total plant cost for maintenance and repair was only $2,679.88, an average of just 67 cents per horsepower for the year. In a year and a half, the new engine has not required any repair at all. The plant is operated under Superintendent F. A. Dennis with Leavy Deal as Chief Engineer. Supervisory control is exercised by a four-man Light and Water Committee, appointed from the City Council by the Council Chairman. City Clerk Sam Southerland handles finances for the municipal utilities. Wauchula looks to her power plant for a dependable supply of electricity for domestic, commercial and industrial consumption. That's normal. But Wauchula also looks to the hard-working diesels for profits to support a hundred varied municipal services that make this a modern city—a safe, healthy, happy place to live.

Equipment Table

Engine	Fairbanks Morse 1280-hp, 8 cyl., 8⅛x10½ in., two cycle, 720 rpm opposed-piston diesel.
Alternator	Fairbanks Morse
Governor	Woodward
Fuel oil	Pure Oil
Fuel meter	Buffalo
Fuel filter	Nugent
Lubricating oil	Rubilene HD30, Sinclair Refining
Full-flow lube filter	Air-Maze
Oil Cooler	Ross
Thermostatic valves	Fulton Sylphon
Auxiliary lube pump	Roper
Radiator	Young Radiator
Air filter	Air-Maze
Exhaust pyrometer	Alnor
Alarms	Viking
Gauges	Marshalltown Gauge Co.



Jacket water for the 1280 hp opposed-piston diesel is cooled in this Young Radiator.



Engine air for the new F-M diesel is drawn through this Air-Maze oil-bath filter.

A NEW TURBOCHARGED TUG

By ARNOLD B NEWELL

A new 1350 hp diesel tug, the *William C. Gaynor* has been added to the fleet of the Great Lakes Dredge & Dock Company of Chicago. The boat which is 94 ft in length over all, 26 ft beam and 11 ft 8 in. depth at side amidships was designed by the Marine Design Section of the Cleveland Diesel Engine Division of General Motors in New York. The builder is the Defoe Shipbuilding Company of Bay City, Michigan. Construction is of welded steel throughout to ABS classifications. The owner with far flung dredging operations requires a good fleet of boats for the movement of equipment from place to place, to tend the dredges during operation and to move dump scows from dredging areas to dumps. As operators in the field of channel and harbor improvement the owners rank high if not the highest in their field both in point of size and excellence of dieselized equipment on fresh and salt water. The *William C. Gaynor* bears the name of the chief mechanical engineer of the company.

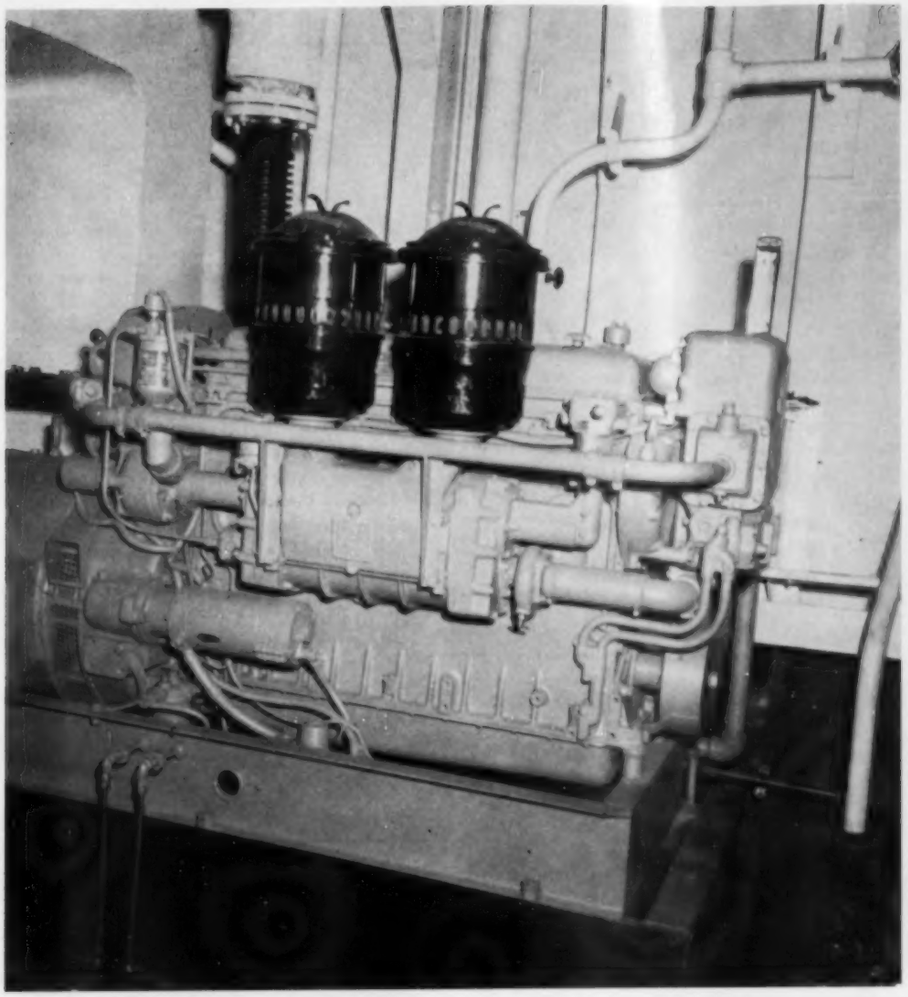
In design and general arrangement the *Gaynor* meets the requirements of a vessel for deep water, long haul operation. The hull has a handsome sheer, rather high bow and ample rise at the stern. Deckhouse is surmounted with a roomy wheelhouse and texas providing comfortable master's quarters. Bulwarks have a sharp tumble home at the stern and the rear deck carries a towing machine built by the Almon Johnson Division of Lake Shore Engineering Co. This is a Series 320 with drum capacity for 1800 ft of 1½ in. diameter towing cable. It is driven by a 50 hp motor. The machine is under an extension of the superstructure deck in a recess in the deckhouse. In other respects the arrangement of towing bits, kevels and anchor lift are conventional.

Since all living quarters are located above deck, with access to all the interior without going outside, the entire hull is utilized for machinery, tankage and stowage. The engineroom is indeed very roomy and this impression is accentuated considerably by the compact nature of the main propulsion engine which is one of the new General Motors (Cleveland) Model 8-498 turbocharged 2-cycle units delivering 1350 shp at 850 rpm. It drives thru a Falk Airflex combination reverse and reduction gear having a ratio of 3.5:1 connected to a 4-blade manganese bronze propeller 8 ft diameter by 6 ft 4 in. pitch.

Since the galley is equipped with an Akron electric range and the towing machine has a 50 hp motor the auxiliary power demand is higher than would be needed otherwise. Therefore the two generators are each made up of General Motors 6-71 diesel and 75 kw Delco generator, 120 volt dc. The main propulsion engine is one of the General Motors V-type 2-cycle units in the 498 series which has 8¾ in. bore and 10½ in. stroke and is sold in 8, 12 and 16-cylinder units. It can deliver as much as 175 bhp per cylinder.

When first announced in August 1955, at the General Motors Powerama, its salient features were pointed out by Thomas E. Hughes, General Manager of the Cleveland Diesel Engine Division. The power delivered per cubic ft of engine is 60 per cent greater than previous models, it has a very flat fuel consumption curve at 50 to 100 per cent at any operating speed and the fuel consumption rate is .360 lb per hr. Through use of turbocharging the thermal efficiency is up to 36 per cent. The exhaust driven turbine compressor operates in series with the engine driven positive displacement blower thus giving operational advantages of considerable importance.

The two generating sets are hooked up through a Smith Meeker dead front switchboard with Safety Industries carbon pile regulators for the floating battery installation, a 60 cell set of 245 amp hr Exide lead acid batteries. There is also a connection for hooking up shore current in port. In the after part of the engineroom is installed an American Engineering Company hydraulic ram type of steering gear controlled from the aft end of the deckhouse as well as the pilothouse. It is



There are two of these General Motors 6-71 diesels driving 75 kw Delco Products generators to meet the usual power demand plus electric range and a powerful electric towing machine.

capable of making a hard over to hard over maneuver in 12 seconds at 12 knots.

The engines are hooked up to Maxim silencers in the stack, heat exchangers for the closed fresh water cooling system are Ross and the 3400 cfm axial flow fan from engineroom ventilation is an American blower unit. Quarters are similarly ventilated by 2050 cfm blower. In general the arrangement of pumping equipment is conventional. Goulds units are as follows: 200 gpm, 100 psi centrifugal fire pump; 110 gpm 65 psi self priming centrifugal bilge pump; 50 gpm at 40 psi fuel transfer; 5 gpm 50 psi rotary fuel service pump and there is a Viking rotary of 90 gpm capacity at 50 psi for lube oil stand-by service. The main engine has the usual arrangement of attached pumps for water and oil to make it a power unit operating independently of separately driven pumps. The lube oil filter is a Honan Crane.

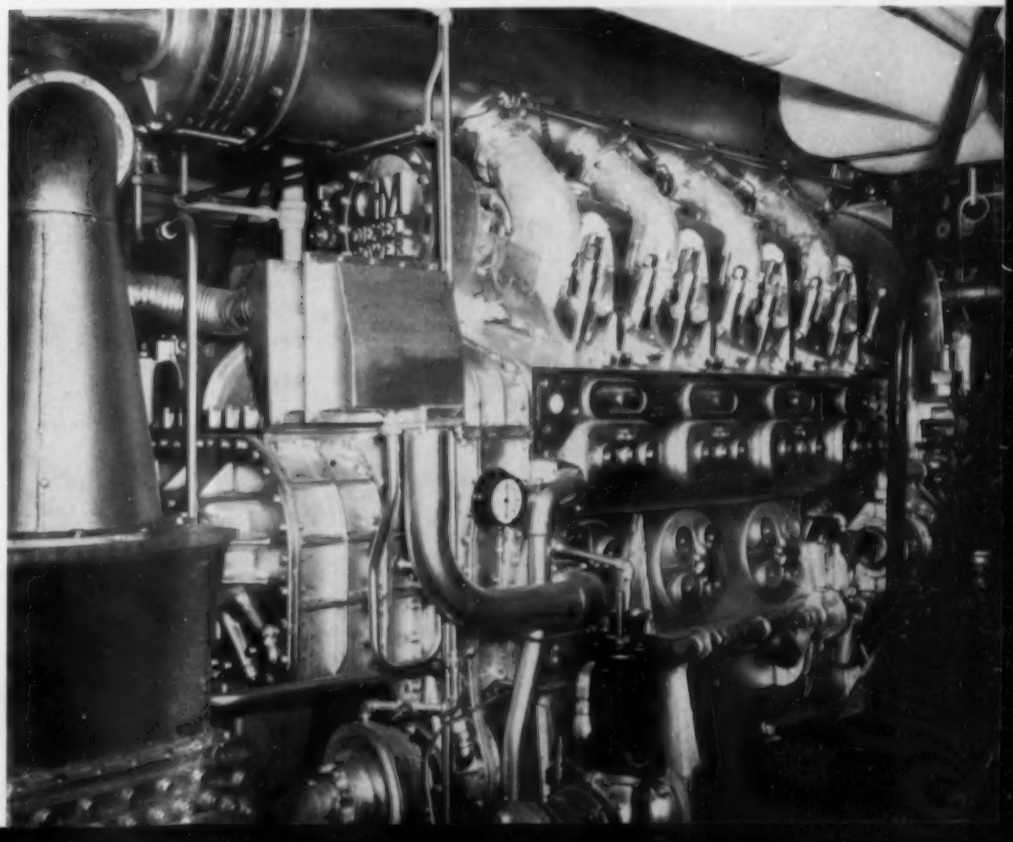
Steam heat for the boat is provided by a Kewanee oil fired boiler. The running hot water is heated electrically and refrigeration is through the medium of a Frigidaire Model AF 020-1130557 machine. A Tested Appliance Co. water purifier is connected into the potable water system using two Decatur pressure sets of 300 gph capacity each. In the engineroom we also find a good arrangement of steel-top work bench, vise, tools and parts storage and suitable lifting gear over the main engine.

The *Gaynor* is fully equipped for long range navigation with all modern devices in the pilothouse, including "windshield" wipers by Sprague Devices Inc. The standard compass is a Kelvin & Wilfrid O. White 7 in. spherical unit. There is a Carlisle Finch 19 in. searchlight and a Kahlenberg Challenge Model S-4 whistle on top of the pilothouse. For communication there is an RCA CR 103 Radar. Radio telephone contains the Lorain AM system and a 5 station VHF system. Direction finder is a Blundworth Standard Arrow. The tankage arrangement is very simple. The fore peak carries ballast for trim, fresh water is carried under the forecastle flat, a large cross bunker carries the full supply of fuel. The after peak is for engine circulation water and potable water is carried in a semi-detached tank in the lazarette area.

Table of Equipment

Main Engine	General Motors Model 8-498, 1350 shp
Storage Batteries	Exide 60 cell-245 amp (an extra large set)
Silencers	Maxim
Auxiliary engines	Pair Detroit Diesels 6-71
Generators	2 Delco Products 75 kw.
Lube Oil Filter	Honan Crane
Whistle	Kahlenberg Challenge
Towing Machine	Almon Johnson
Reverse & Reduction Gear	Falk Airflex

Main propulsion engine of the Gaynor is one of the new General Motors turbocharged diesels with a fuel consumption rate of .360 lb per hp hr. This engine is as compact as it is power packed and has extraordinary accessibility. It is equipped with two Marquette Governors.



SHELL BREAKS IN A NEW DRILLING RIG

By DOUGLAS SHEARING

A drilling rig expected to set new standards of portability for its drilling capacity has recently arrived in the Denver-Julesburg Basin oil field where it is being put into operation by the Shell Oil Co. Diesel-electrically-driven, the apparatus is designed to be set up at a drilling location and taken down in at least one day's less time than other comparable equipment now in use, according to the manufacturer. With ground previously prepared for the mud-pumping system, the rig's designers expect that under normal conditions it should be ready to drill within an hour or two after its arrival at the site. This is because it employs an electric drive, built by General Electric's Locomotive and Car Equipment Dept. in Erie, Pa., that is easy to set up and knock down.

The rig is able to drill with standard pipe to 7,000 ft with a standard safety factor. It breaks up into three trailers. Ideco, one of the Dresser Industries, constructed the rig to Shell's requirements on a contract placed with the Jones and Laughlin Steel Corp., Supply Div. The prime power source is four D-337-F Turbocharged Caterpillar diesel engines to be continuously operated at 200 hp. The electric drive is a motor-generator-control package. Its components are basically the same as those that have been used successfully on locomotives, but with certain modifications.

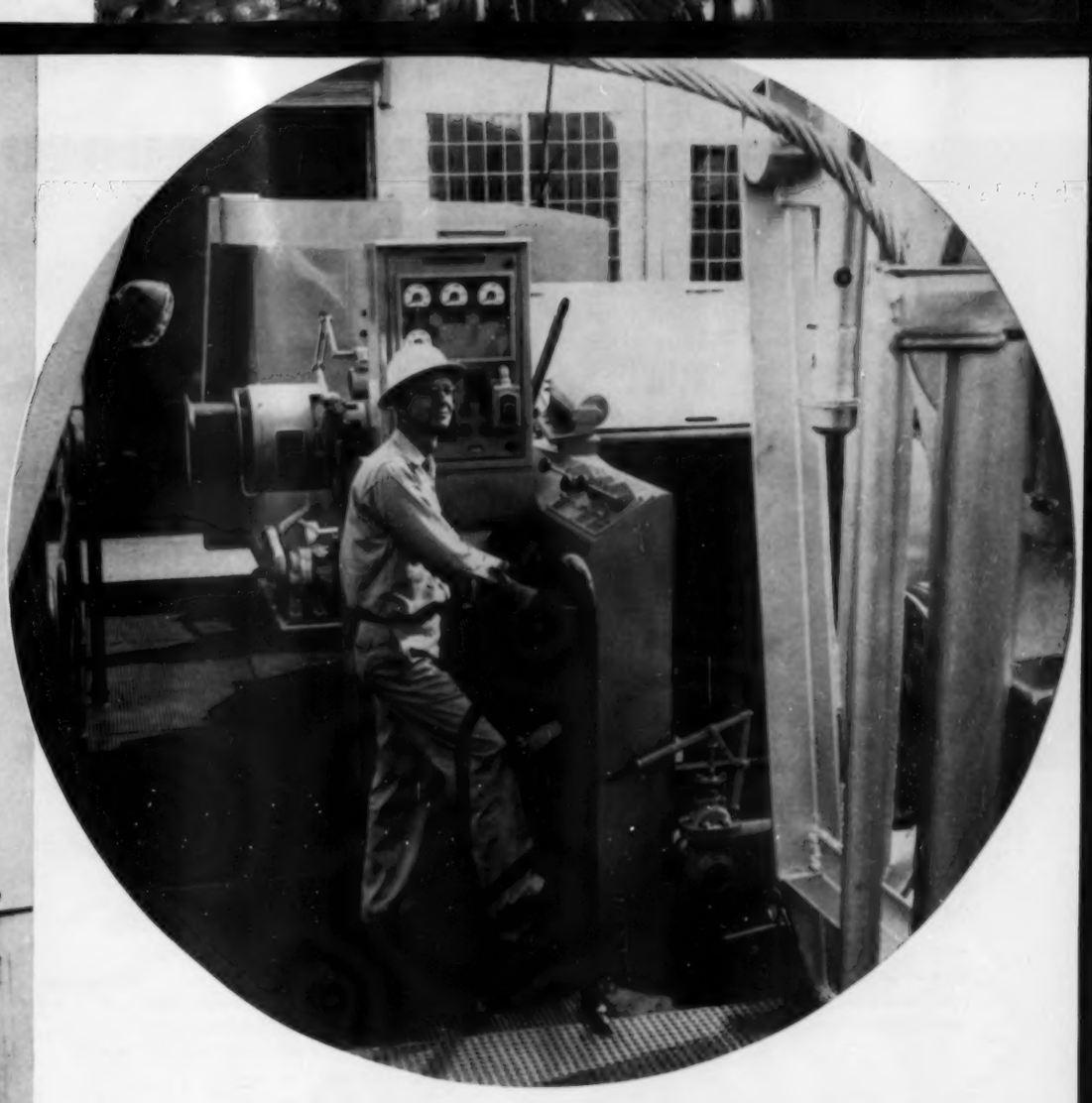
The rig's ease of assembly and disassembly is possible because the major parts of this power system remain installed on a trailer and all connections are made with flexible electrical cable. Eliminated is the need for moving heavy pieces of equipment on skids and aligning them. Upon arrival at the drilling site two trailers are pinned together to form a single, rigid working platform. One trailer carries the 105 ft mast, and the other contains the drawworks mechanism. The diesel engine-generator and control sets, all installed on a third trailer, are attached with electric cable to a motor that drives the drawworks and the rotary table, and a motor that drives a mud pump. Provisions are included for adding a second mud pump later. These motors have been changed from series (the standard locomotive type) to shunt-wound, and they have a continuous rating of 625 hp. For drawworks duty an intermittent rating of 1,000 hp.

The mud pump system is installed on a skid which is carried on a trailer. It is the only part of the basic unit not permanently mounted on wheels. The rig itself is an Ideco Dual Rambler with a guyless-type Kwik-Lift mast, and E-525 hoist adapted to Shell's requirements. The drawworks trailer is 43 ft long and 10 ft wide. On it are the drawworks hoisting mechanism, the electric drive motor, a propeller shaft that transmits power from the drawworks to the rotary drilling table, a crew change house, a wire line measuring device and air compressors. The mast and substructure trailer is 70 ft 6 in. long over-all, but the substructure unit is detachable which reduced the length to 65 ft. The trailer carries an Ideco 17½-in. rotary table, raising legs, leveling jacks, catwalks, spooling drums with 2,000 ft of 1⅛ in. wire line, 160-ton shorty traveling block, a device to keep the catwalk level at 4 ft and the mast itself. The mast, internally-guyed, has a net hook capacity of 268,000 lbs with a standard safety factor. Two raising legs swing outboard to form stabilizers after it has been erected.

The power trailer is 37 ft long and 10 ft wide. Permanently installed on it are the four Caterpillar engines. Two smaller Caterpillar D-318 diesels are temporarily installed with General Electric generators to provide auxiliary power. Coupled to each larger engine is a General Electric flange-mounted locomotive-type generator, self-separately

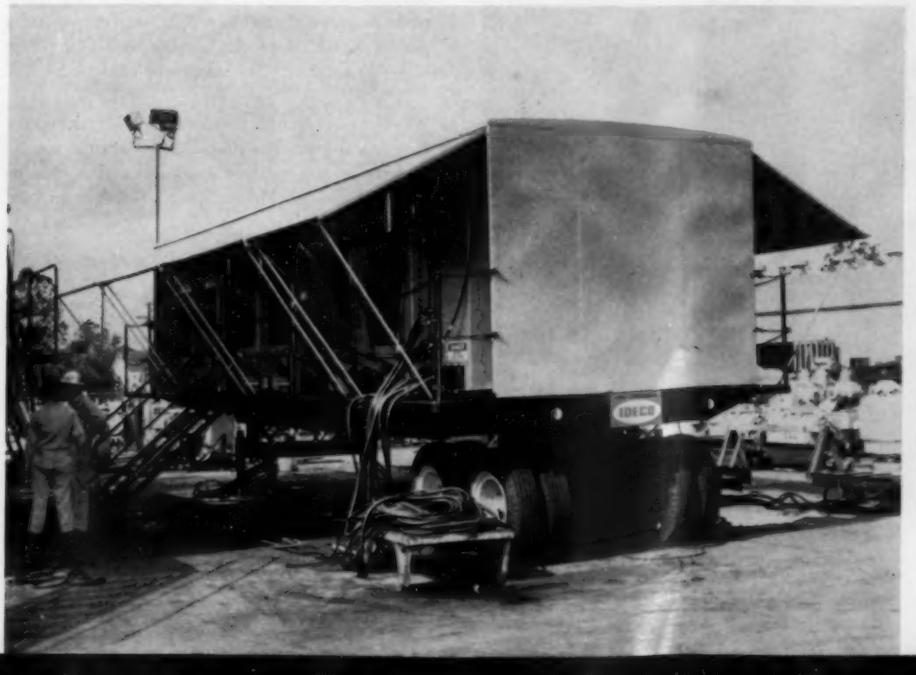
The power trailer, shown here, is 37 ft long and 10 ft wide. It houses four Caterpillar D337F turbocharged 200 hp diesel generator sets for main power requirements and two smaller Cat D318 generator sets for auxiliary power. A complete control set for the power units is installed in the trailer. The engines each drive a GE generator, and combined provide the full power requirements of the rig.

The highly portable Shell drilling rig at the Ideco factory in Beaumont, Texas before moving to the Denver-Julesburg Basin oil field. The completely self-contained rig breaks up into three trailer units for travelling.



Operator standing at driller's console on drawworks trailer, which here is pinned to mast and substructure trailer. Driller has four switches at console, enabling him to instantly bring into operation any combination of the engine-generator sets.

Other side of the Ideco power trailer. Note cables connected to the control set that carry the electricity from the Caterpillar diesel generator sets to the motors which drive the drawworks and rotary table and the mud pump.



excited. Attached to the smaller engines are D-318 generator sets, built by General Electric for Caterpillar, that provide 30 kw alternating current three-phase 60-cycle power for auxiliary operations, and a 25 kw direct current generator for motor-generator excitation and control circuit power. Also on the trailer is a weatherproof main control panel, adapted from locomotive equipment, that can instantly bring into or out of operation any combination of the engine-generator sets.

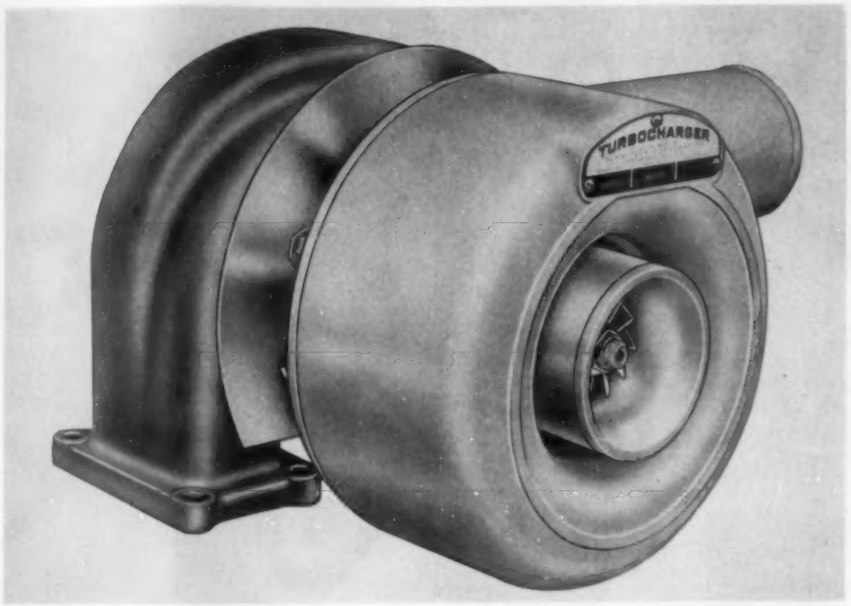
The driller, at his console at the driller's station, sets up these combinations with four switches, one for each engine-generator set. Each switch has four positions marked drawworks, mud pump one, mud pump 2 and off. He also has speed controllers for each rig load. Although diesel and gas-electric power has been used for oil drilling on land, the Shell rig is one of the first to take full advantage of the light weight and flexibility of the modified locomotive-type equipment. General Electric is marketing a line of standardized electric drilling transmission components that can be made up into building block packages.

NEW SCHWITZER TURBOCHARGERS

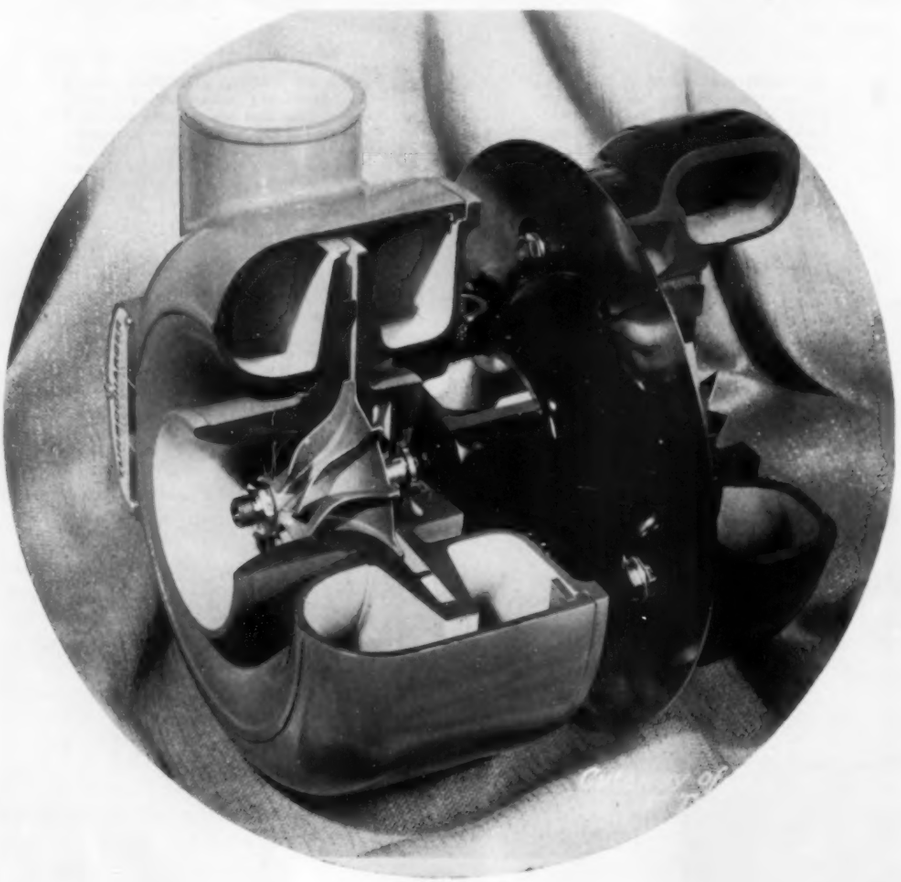
By DWIGHT P. ROBISON

With an accumulated ground usage of many million of miles, Schwitzer Corporation announces production of a new advanced design of turbochargers. These new models incorporate many new engineering features as a result of this vast experience gained through a wide variety of installations now rolling up thousands of additional miles and hours of operation each day. Installations are in trucks, buses, tractors, marine applications, earth moving equipment, including highway and off highway installations as well as stationary engine applications of all type.

Greater efficiencies are now offered in the design of this new series of air cooled turbo units which combine the characteristics of flexibility, light weight, and compactness with new increased capacities per unit size and higher pressure ratios. The increased flexibility of air cooling now permits the use of Schwitzer's turbochargers with both water cooled and air cooled engines. All water connections are eliminated and only two oil connections with the engine are required for lubrication and cooling of the bearing and shaft assembly. These units are



The Schwitzer 4 in. turbocharger shown here, features a clean, compact exterior design.



Cutaway view of the new Schwitzer 4 in. air-cooled turbocharger.

capable of operation at pressure ratios up to 3.0 to 1. The new turbos are available in a series of eleven models designed around three basic wheel diameters, three-inch, four-inch, and six-inch. This permits greater interchangeability of common parts and reduces both production and servicing costs.

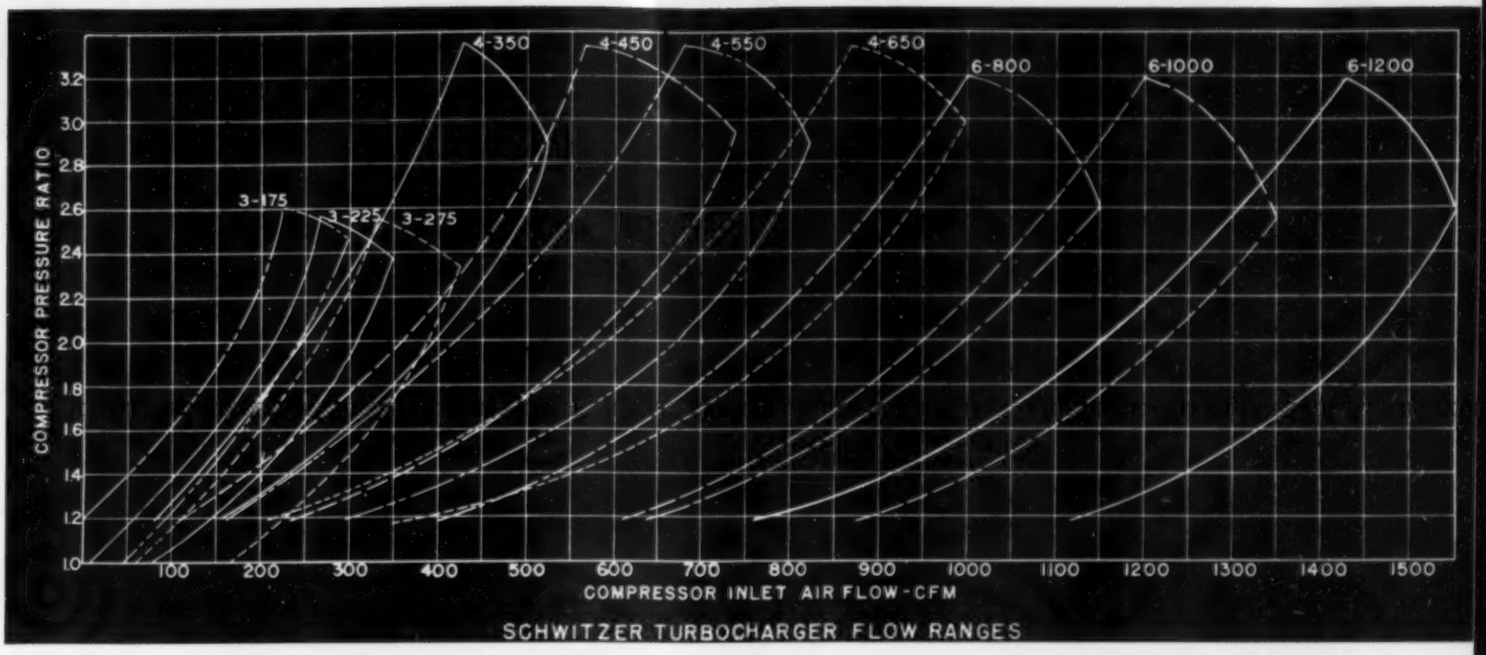
The overlapping flow ranges, as illustrated on the accompanying chart, permits the customer to use near maximum compressor efficiency on a greater range of engine sizes. These are in addition to the five-inch and six-inch water cooled designs which will continue to be popular on many applications such as in marine use. The enclosed area of the curve for each model is from 95% to 100% of maximum compressor efficiency. The overlapping areas permit matching of any engine within the flow range to within 2% of maximum efficiency.

The light weight of Schwitzer turbochargers and the compact size permits simplified mounting, usually directly on the exhaust manifold, within existing space limitations. The turbine and compressor inlet

The weights and air capacities are as follows:

Turbine Wheel Size	Approximate Air Delivery	Weight
3.0 in.	150- 350 cfm	26 lbs
4 in.	325- 850 cfm	36 lbs
6 in.	800-1400 cfm	75 lbs

The above airflows are air flows at a pressure ratio of 2.0 to 1 and are measured at compressor inlet.



and outlet flanges may be varied to any one of several angular positions enabling the customer to mount the unit in the most compact manner. Unlike mechanically driven superchargers, no costly gear trains, couplings and special mountings are required with these turbochargers. The cost, therefore, will usually be less than the mechanically driven type.

The Schwitzer turbocharger can be adapted to a wide variety of engines without change in basic design. Interchangeable turbine nozzle rings are available to match the operating conditions of each specific engine application. The divided turbine housings and nozzles are designed so that the turbine can be operated either as a blow down turbine or as a steady flow turbine. Ordinarily, better results can be obtained by operating on the blow down principle. This involves dividing the exhaust manifold so that there is no overlap of the exhaust processes of the cylinders discharging into any one branch of the manifold. The divided manifold and turbine housing will make better use of the exhaust gas energy. Lower average exhaust manifold pressures and better cylinder scavenging will result.

Increased efficiencies have been developed and turbine operating speeds have been increased beyond those believed practical only a short time ago. Also, significant results are being obtained with the use of after coolers which reduce the temperature of air leaving the turbocharger and permit increased performance over a wider range. The use of the after cooler is encouraged wherever possible.

The turbine housing is a Ni-Resist casting capable of withstanding high temperatures without scaling or stress failures. The bearing housing is a high quality grey cast iron and the compressor housing and cover are heat treated aluminum alloy castings.

The present recommended exhaust gas temperature limit is 1500° F for intermittent operation. The bearings are of the sleeve type and are lubricated by engine oil. A double piston ring type oil seal is used at each end of the shaft. It is pressurized by an air bleed from the compressor to effectively seal off leakage. Axial shaft location is fixed at the compressor end. The compressor and turbine wheels are designed for thrust equilibrium so that their thrusts between them is balanced out.

The design configuration of the cobalt base alloy turbine wheel combined with aluminum compressor wheel, result in low inertia and low stress. Only a fraction of a second is required for the turbo to reach full speed when the load is suddenly applied to the engine. On variable speed engines such as trucks or buses, this is of prime importance to the vehicle operator. Schwitzer turbos are used on many popular truck, bus and tractor diesel and gasoline engines, and stationary engine equipment as well. They are designed for long, reliable service, and require only normal maintenance afforded other parts of the engine.

Another cutaway view of the Schwitzer air-cooled light weight turbocharger.

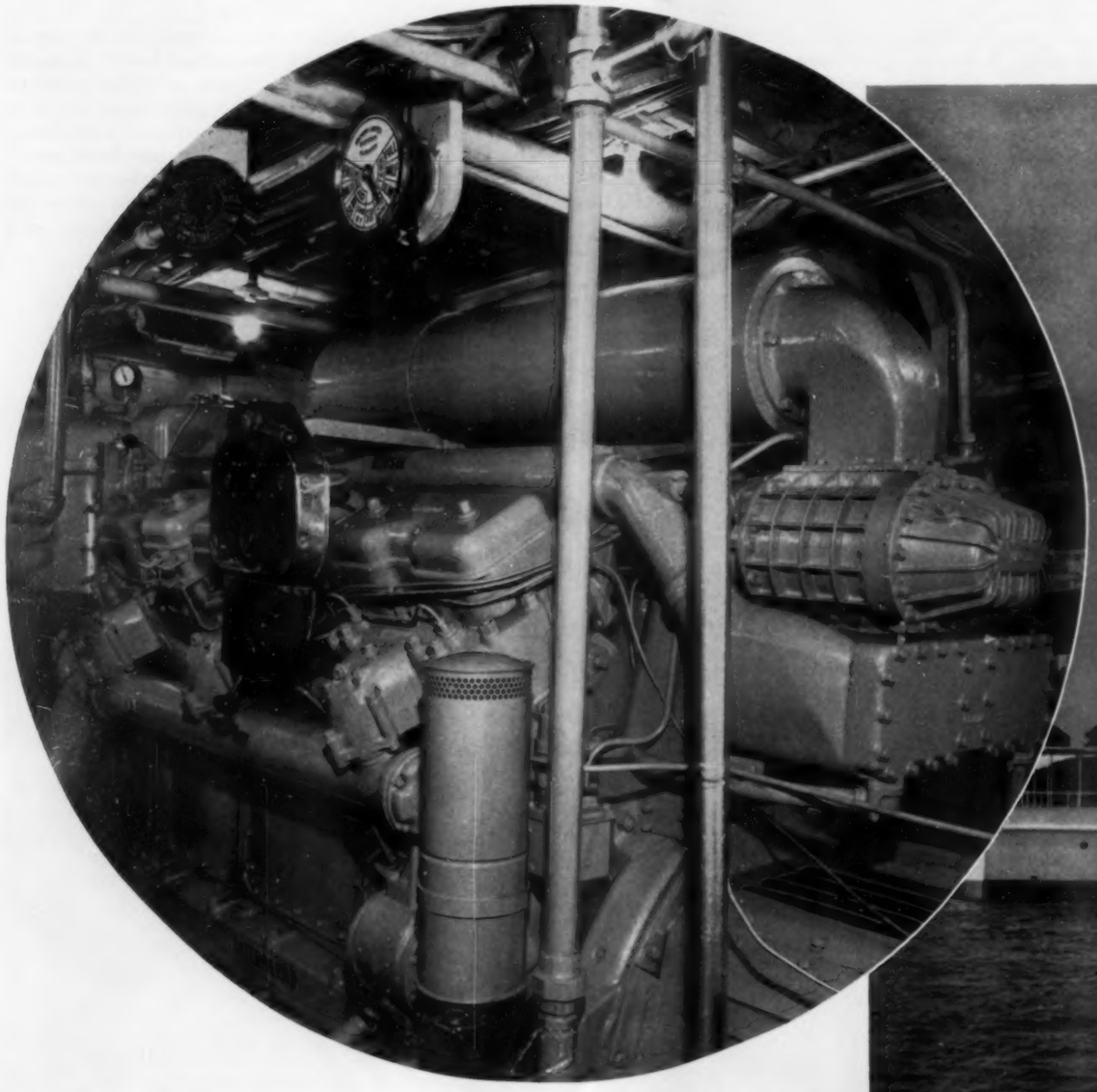
THE DIESEL YACHT *PIMPERNEL*

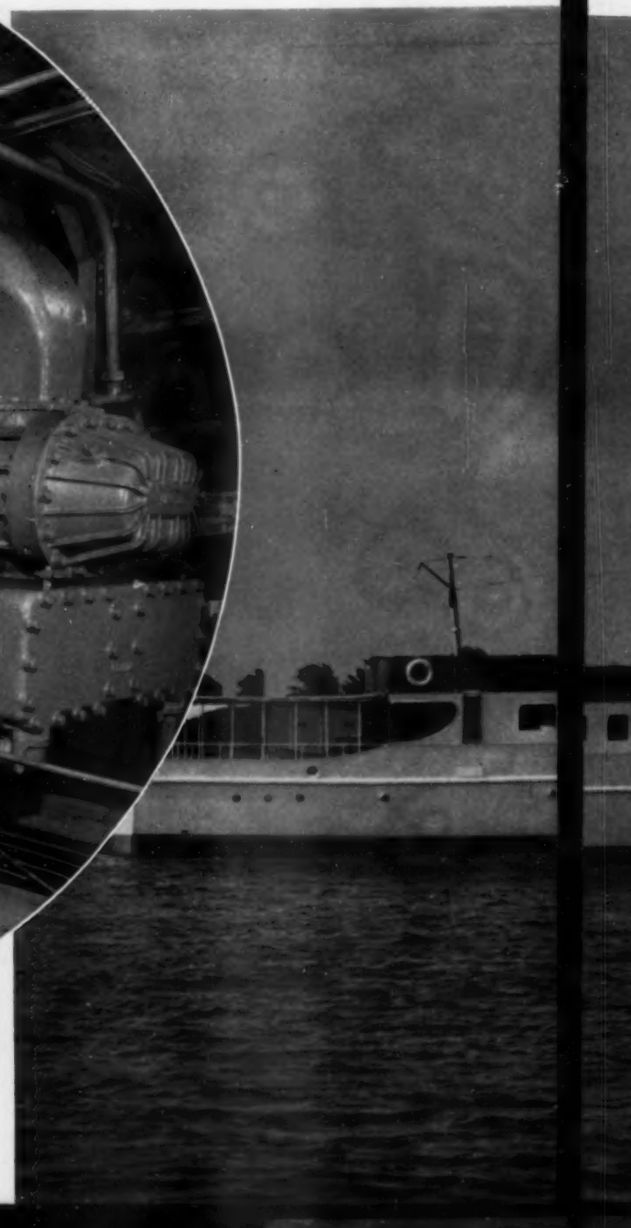
One of the Really Big Yachts to be Found in Southern Waters This Winter is a 121-Footer Owned by Mr. Joseph Tomlinson.

By ED DENNIS

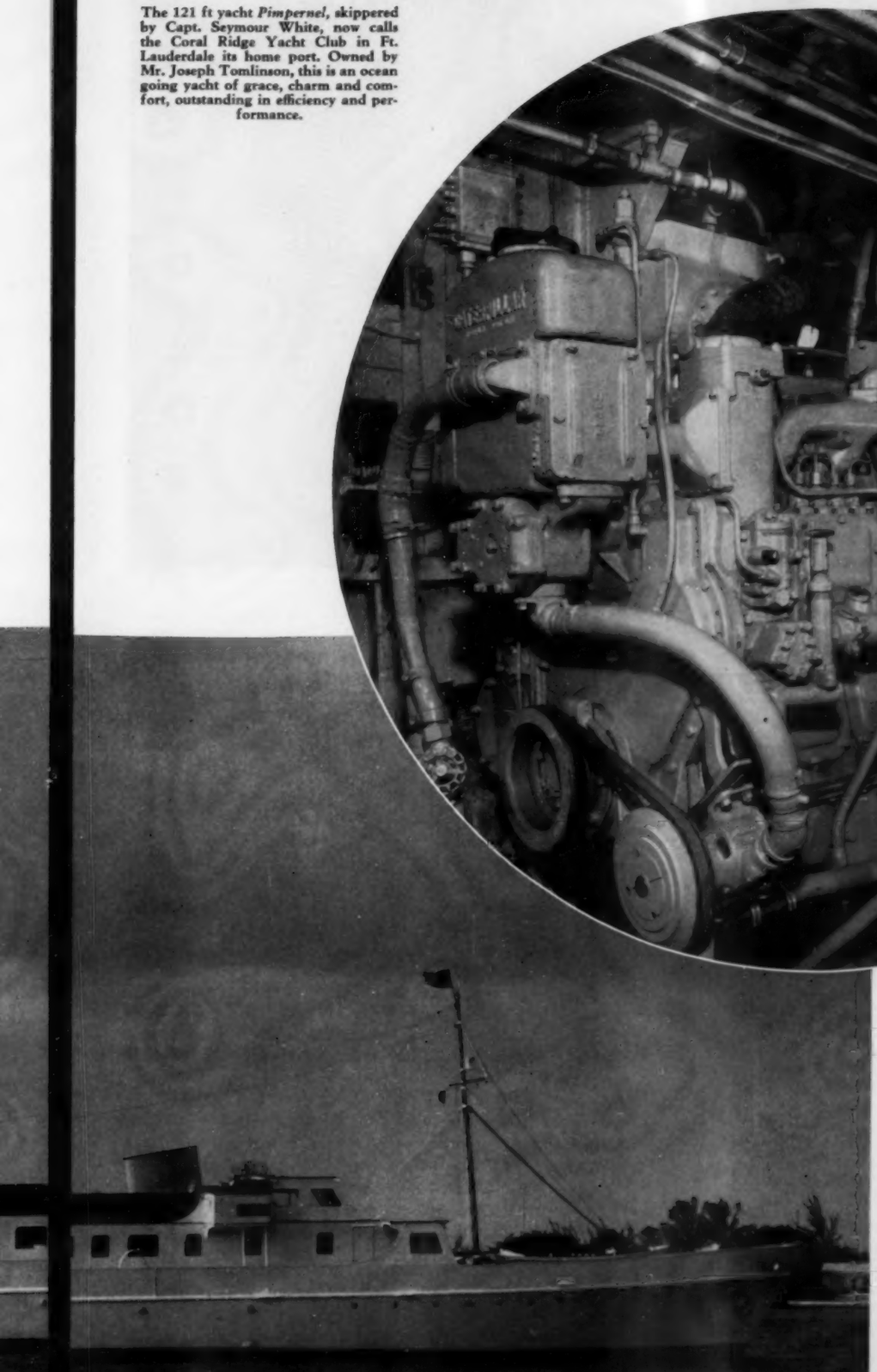
NO story about the Florida yachting fraternity would be complete without mentioning the Fort Lauderdale based yacht *Pimpernel* which has a very interesting and exciting past. It was one of five constructed in England during W.W. II, to run the German blockade from Sweden to England with 30 tons of badly needed Swedish ball bearings. Built in 1943 of 1½ in. diagonal mahogany planking and 1 in. mahogany deck planking with a steel frame, it was redesigned in 1949 as a private yacht to give maximum private cruising accommodations for the owner, eight guests and a crew of six. Four full size bath tubs and toilet facilities have been worked into this beautiful yacht to make it a comfortable living yacht.

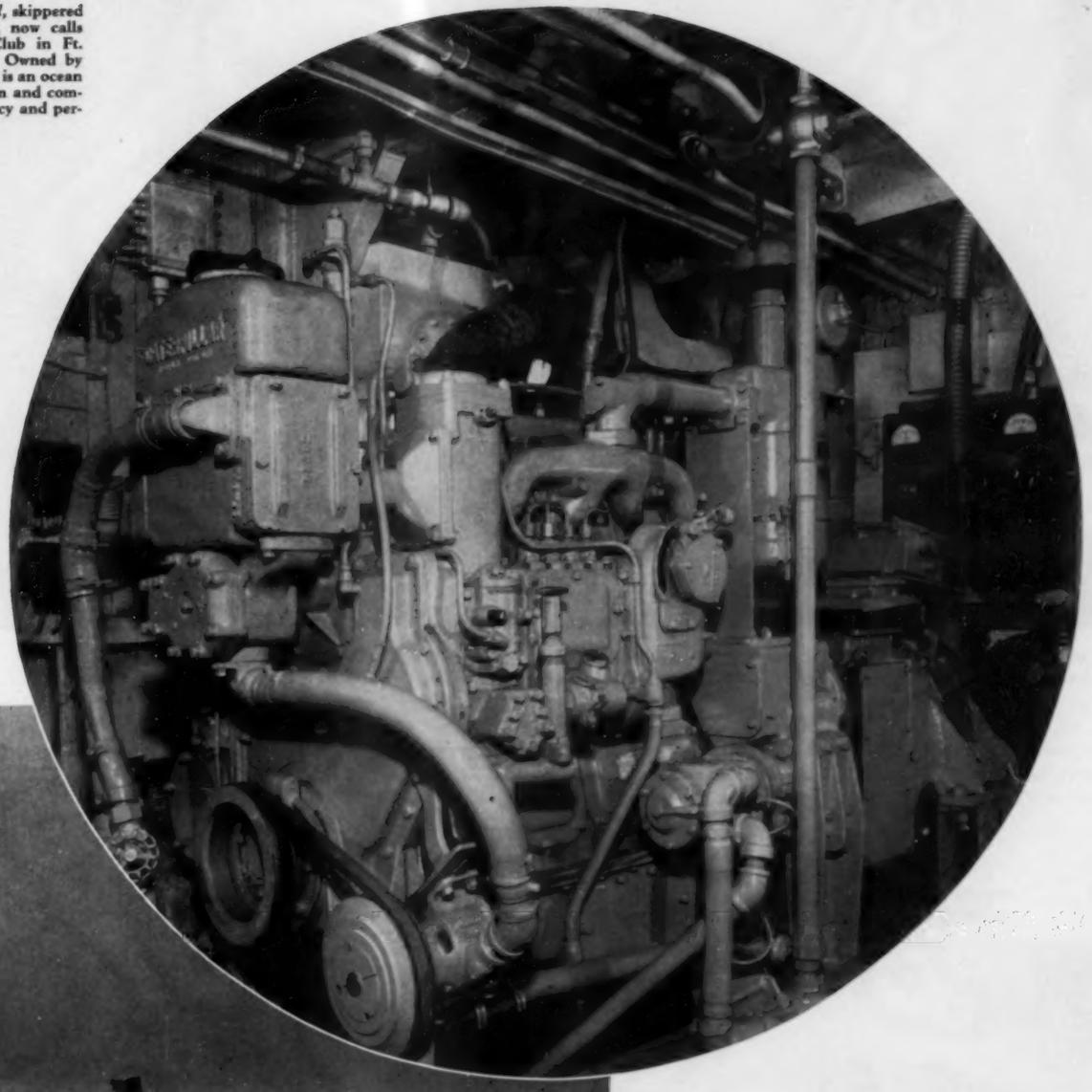
It has been repowered with two model D397 Caterpillar diesel engines each rated 450 hp at 1225 rpm. These are 12 cyl. 4 cycle engines with the Roots type mechanically driven blower, having a 5¾ in. bore and 8 in. stroke. Each engine has Falk 2.815:1 reduction gears giving the *Pimpernel* a cruising speed of 13½ knots and a top speed of 15 knots. A Burgess-Manning silencer is used on each diesel. For auxiliary power, two model D311 Caterpillar diesels supply the power for the 15 kw 220 volt dc generators. A Gardner-Denver air compressor unit is in the engine room. The Caterpillar diesels were engineered and installed by Shelley Tractor & Equipment Co., Miami, Florida.





The 121 ft yacht *Pimpernel*, skippered by Capt. Seymour White, now calls the Coral Ridge Yacht Club in Ft. Lauderdale its home port. Owned by Mr. Joseph Tomlinson, this is an ocean going yacht of grace, charm and comfort, outstanding in efficiency and performance.





One of the two D311 Caterpillar diesel engines which supply power for the 15 kw 220 volt dc generators.

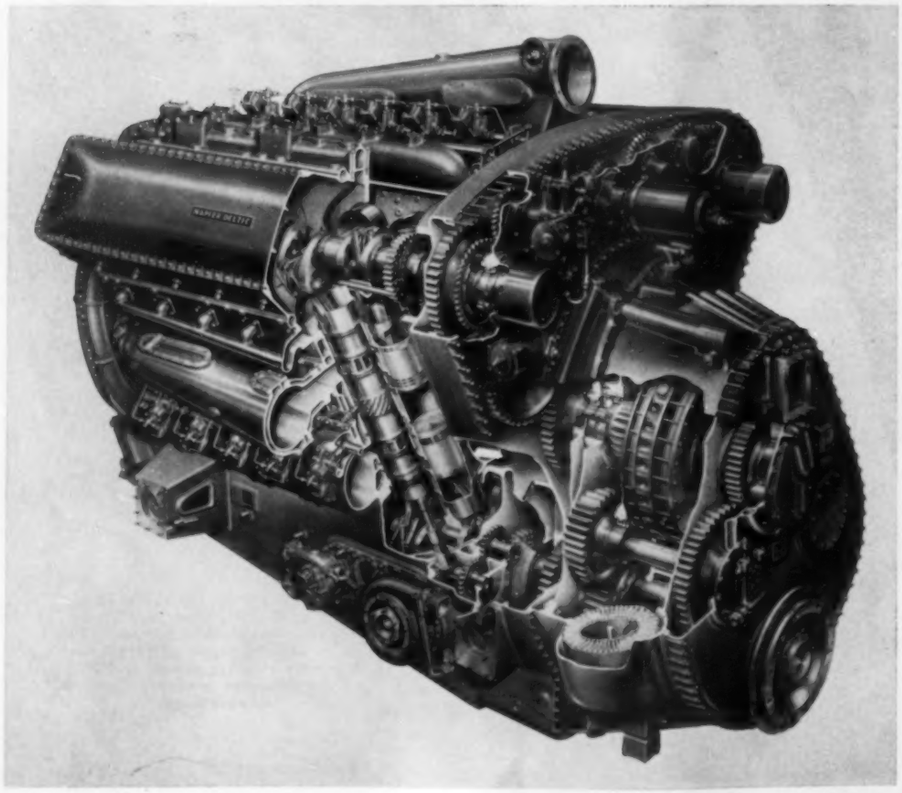
One of the 450 hp Caterpillar diesels which are the main propulsion for the twin screw 121 ft yacht, *Pimpernel*, to give it a cruising speed of 13½ knots. A Burgess-Manning silencer and Falk 2.815:1 reduction gears are installed on each diesel.

H. M. S. *Dark Aggressor*—one of the latest Royal Navy Fast Patrol Boats, powered by two Napier Deltic high-speed marine diesel engines, each having 2,500 bhp.

THE NAPIER DELTIC MARINE DIESEL

By DOUGLAS SHEARING

Napier Deltic 18 high-speed marine diesel engine, sectioned to show cylinder liner, horizontally opposed pistons, crankshaft and ahead/astern clutch and gearbox. (output shaft end).



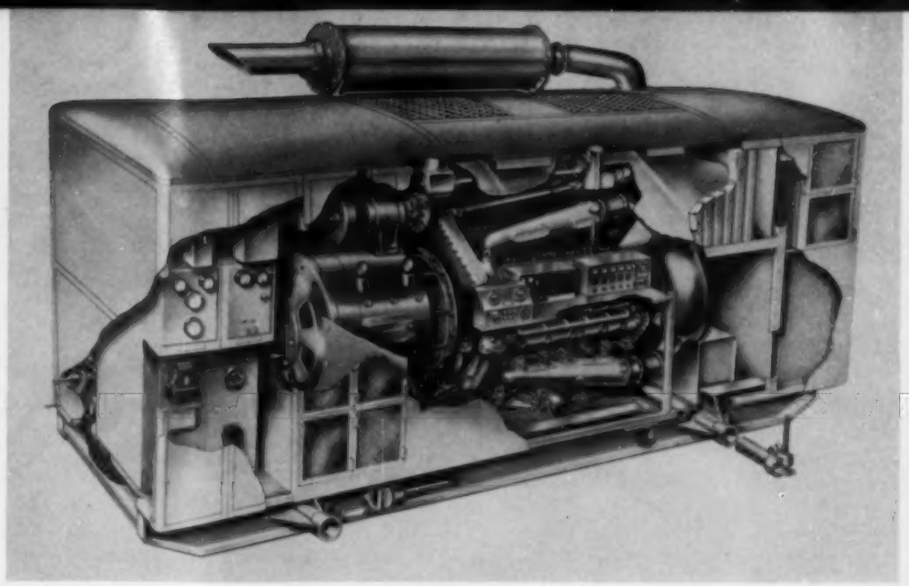
A British high-speed diesel engine of importance as a prime mover in the marine, industrial and railroad spheres is, by virtue of its versatility, arousing interest amongst engineers and transport executives alike in the American continents. It will soon make its first appearance on this side of the Atlantic powering the very latest crew boats employed by a major oil company for service between base and off-shore drilling rigs. This diesel has already served many thousands of hours with various Navies and in other marine installations throughout the world.

Designed and built by Napier, this engine—the Deltic—earns its name from its unique configuration. It is an opposed-piston compression-ignition engine of low weight, having three banks of cylinders in the form of an equilateral triangle, an arrangement which results in a most compact engine and in turn can make possible great improvements in machinery arrangements. It offers substantial advantages in all cases where considerations of weight and space vitally affect the performance, or the overall capital cost of the installation. Furthermore, the Deltic's design results in an almost complete balance of the reciprocating forces and masses within the engine frame. The major rotating forces are also balanced and these features contribute to a smooth running engine, in which the frame is free from vibration. The engine in either 18 or 9-cylinder form, delivers up to 2,500 or 860 shp respectively at a maximum of

2,000 crankshaft rpm in the case of the larger engine. There is a phase angle difference of 20° between the exhaust and inlet piston in each cylinder, permitting the use of port layout capable of highly efficient scavenging and cylinder charging. Precision of manufacture also results in the complete inter-changeability of the major units and subsidiary equipment. Extensive use of the overhaul by replacement principle becomes a practicability and means that a major overhaul after some 5,000 hours of running is effected by removing the engine and replacing with another one, in a very quick operation.

The Deltic has a power/weight ratio of 3.5 lb per hp and combines well-tried features of diesel engine design with its new layout. These innovations are of technical merit and contribute greatly to the engine's overall performance. Efficient end to end scavenging of the cylinders through generous port areas and flow passages is obtained by the opposed-piston without sacrificing the effective stroke. Valves and their associated problems are eliminated, together with cylinder head sealing problems. Since the combustion chamber walls consist mostly of hot piston crowns, heat losses are minimized with a consequent increase in thermal efficiency.

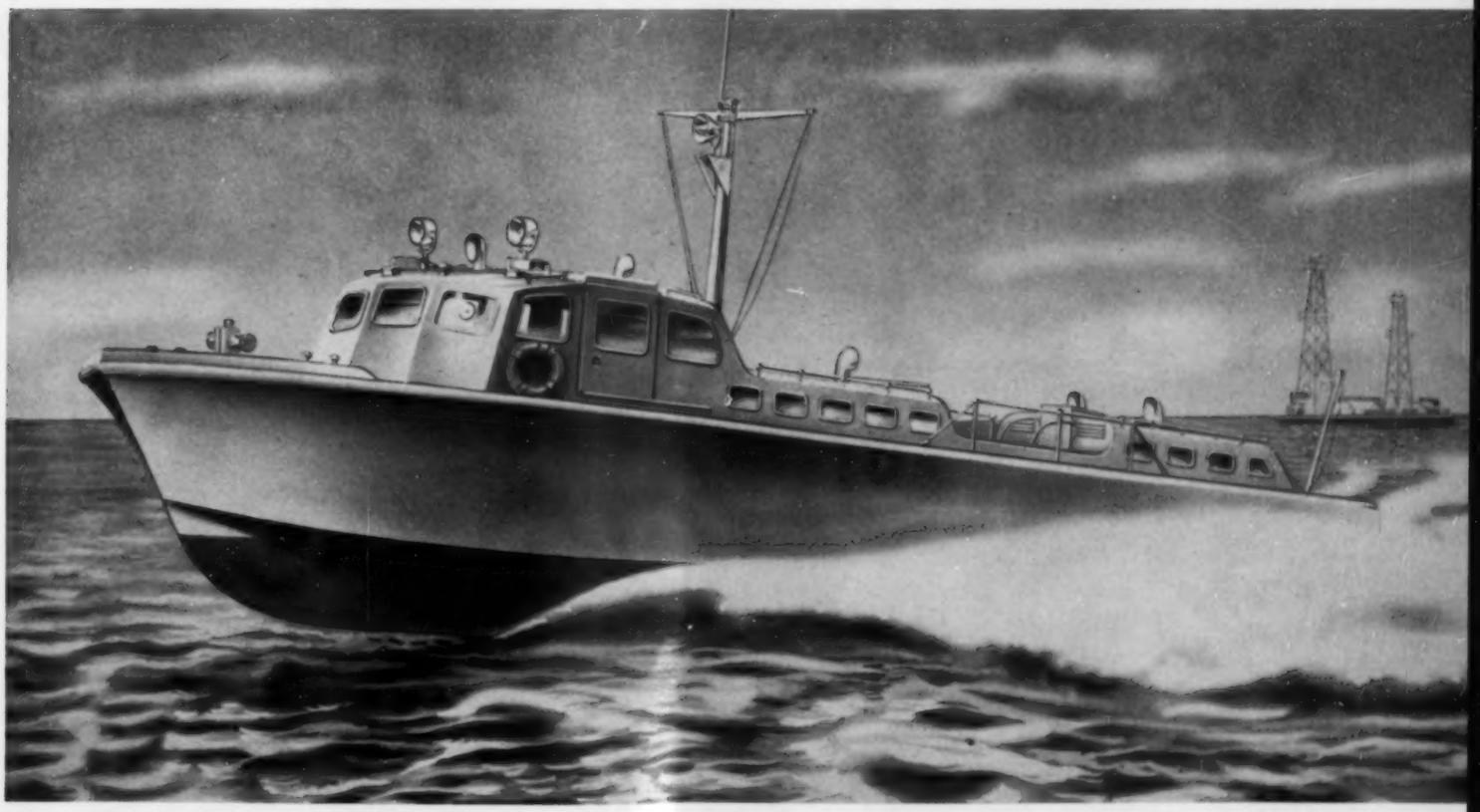
In marine installation, such as crewboats, an engine layout which helps to keep machinery weight aft and so allow more space amidships is the V-drive gearbox which is commonly adopted with the Deltic. On Lake Maracaibo in Venezuela, the Shell Company will operate fast crewboats powered by twin Deltics, between the shore and oil rigs located near the center of the lake. Three of these vessels will speed personnel to and from their work at 30 knots; two spare Deltic diesels will ensure a continuous maintenance rota and take only a few hours for engine change. In merchant vessels, engine room space is saved and reliability assured by adopting a multi-engine installation with two or more Deltics coupled hydraulically to a gearbox driving one propeller shaft. In the event of one engine breaking down at sea, the ship's passage is not impaired.



The Deltic "Compak" is a mobile, self-contained power-unit for supplying power at industrial and constructional undertakings in remote regions, or for reinforcing electricity supply systems at peak loads. The picture shows a Napier Deltic 18 engine coupled to a generator and the whole unit is self-contained.

The eighteen cylinder Deltic marine diesel weighs about 11,000 lbs and the nine cylinder version 8,000 lbs. The more powerful engine gives a power/weight ratio of .217 shp per lb. The light alloy casings and small components make engine service quick work. Either air or cartridge starting are employed. Both these methods are simple and reliable. The engine auxiliaries such as water circulating pumps, fuel and lubricating oil pumps are integral, resulting in a completely self-contained unit.

Impression of fast passenger vessels being supplied for taking personnel to offshore drilling stations at 30 knots. Each is to be powered by two Deltic 9 marine engines.



PORTABLE POWER FOR CO-OP

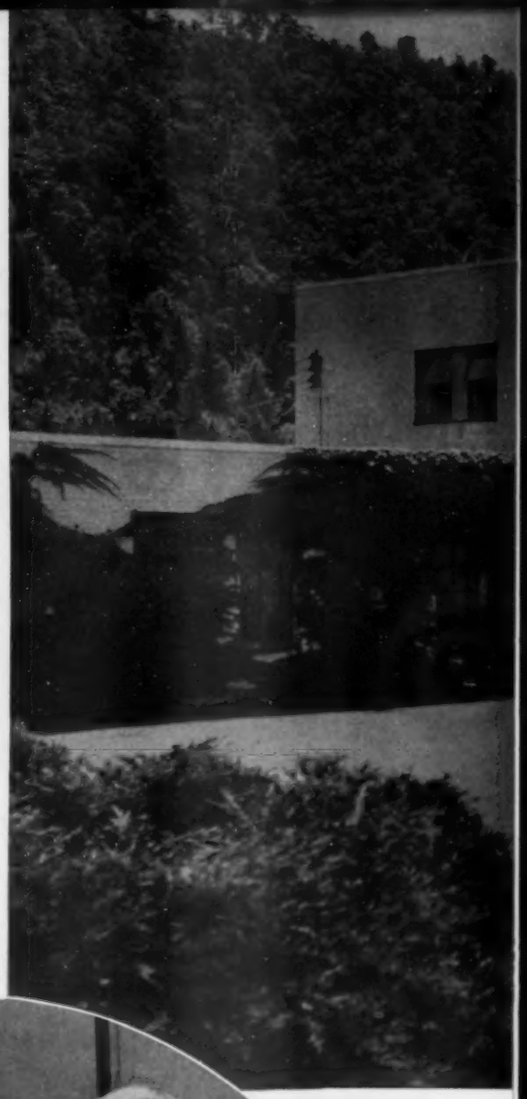
By J. S. ELSNER*

THE REA was enacted by Congress to give more people the advantage of electric power. It was intended to serve the remote areas where there was either no power, or costly, poor quality, home made power. The word serve has become a very important word to Valley Rural Electric Co-op of Huntingdon, Pa. Now that all farms in the areas they serve are keyed to electricity, Valley Rural believes in maintaining the most reliable service possible. Valley Rural is located in south-central Pennsylvania with lines running from 13 substations up the valleys to their rural member consumers. The original 200 miles of line built in 1939 have expanded to cover 1300 miles today.

With the addition of new consumers and greater consumption by existing member consumers, the main lines of Valley Rural are approaching overloaded conditions. The problem of John Denton, Manager of Valley Rural since 1939, was how to keep service to the members of the Co-op and yet not subject the construction men to the extra risk involved in working hot lines. Because of the terrain, loop circuits in much of the area are impossible. The only solution was an alternate source of power. This had to be portable to be used at different locations in the wide area in which the system improvements are to be made. An analysis of the system indicated that about 300 kw, three phase, and 100 kva, single phase, would handle most of the loads to be encountered. Voltage required was 12470/7200, three phase 4 wire and 7200 volt single phase. After investigation, bids were taken and a trailer mounted Caterpillar D397, 300 kw, diesel electric set was selected. Power is generated at 2400 volts delta and by means of transformers boosted to 12470/7200 Y. This makes a very flexible unit with three voltages always available.

For single phase operation, the phase which is sampled by the voltage regulator (single leg to neutral) is used. This assures a constant output voltage with variations in load. If more power is needed than can be developed by one phase of the generator, the unit is moved to a central location on the line and two phases of the generator are used. One phase is fed one way and a second phase fed the other way after parting the line somewhere near its load midpoint. Many advantages and savings are possible with this portable unit in addition to maintaining service to the consumers at all times. The biggest saving is in construction cost. Before obtaining the portable power plant, it was necessary to work a short day—cut the power at about 8:30 a.m., restore at 11:30 a.m. for lunch; cut again at 1:30 p.m. and restore at 4:30 p.m. This cut the work day to six hours of production, less time-consuming cutins and cutouts. Now with the portable unit the consumers can be on the alternate source of power all day long with only an instantaneous outage necessary for switching. Mr. Denton estimates that the cost of his system improvements will be reduced at least 20% with the portable power arrangment.

Portable power also finds application in times of emergency. In an area of sleet storms, the unit will be good insurance for the members of Valley Rural against long outages due to broken feed lines. When not in use for construction or emergency power applications on the Valley Rural system, Mr. Denton intends to make the Caterpillar portable power unit available for rental throughout Pennsylvania and adjoining states for any electric power application. For example, similar units have



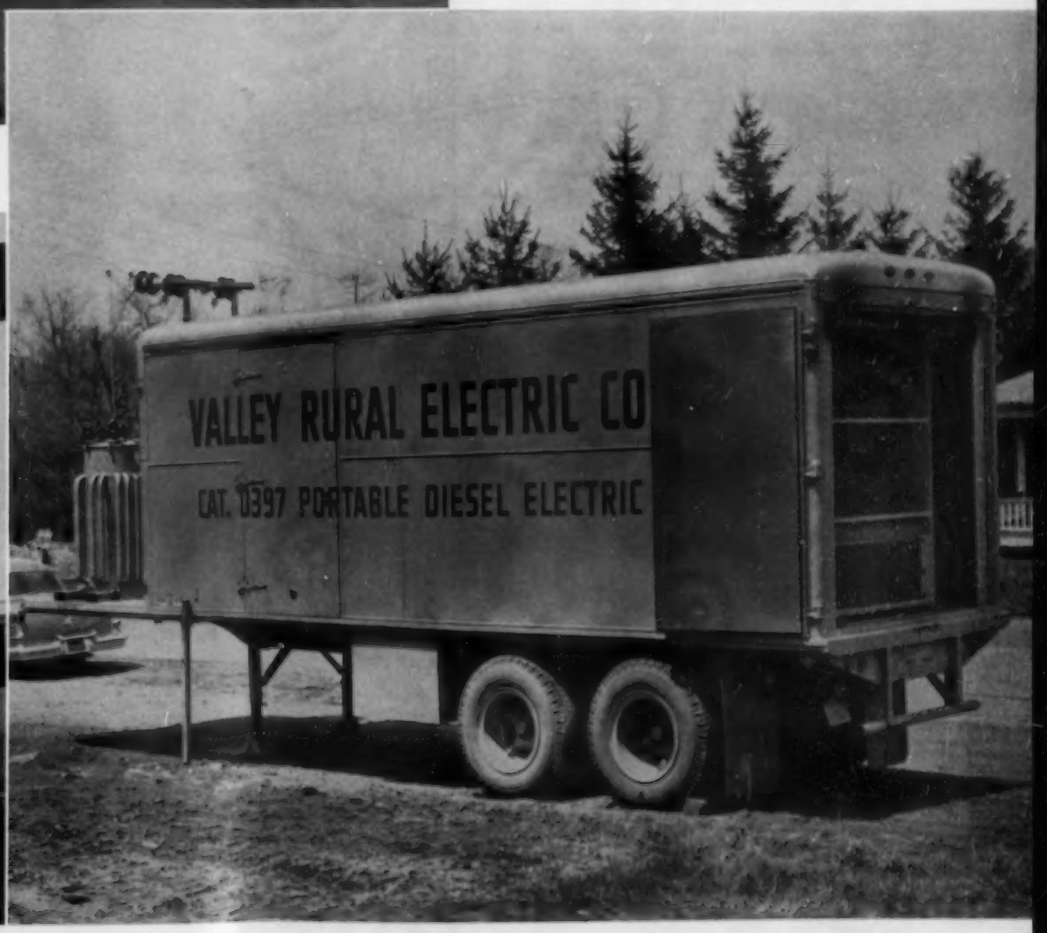
Stuart Elsner, Beckwith Machinery Co.; John Denton, Manager Valley Rural Electric Co-op; and R. B. Long, Board Member of Valley Rural Co-op, discussing use of Caterpillar portable diesel generator set.

*Sales Engineer Beckwith Machinery Co., Pittsburgh, Pa.

been used to power electric shovels from one high line to another. Also, some county fairs have been denied some of the larger midway attractions because not enough power was available. These are but two of the many applications for such a unit. If the load requires, additional units can be operated in parallel with this unit. Moreover, it can be operated in parallel with the main source of power to raise voltage out on the end of a line.

Components of the Caterpillar D397, 300 kw, portable diesel generating unit are: Engine—Caterpillar D397 V-12 mechanically supercharged 450 cont. hp at 1200 rpm. Generator—General Electric—300 kw, 1200 rpm, 375 kva, 3 phase, 60 cycle, 2400 volts, two bearing with direct connected exciter. Switchboard—Electric Service Engineering Co. Trailer—Transport Trailers, Inc. Starting Air Compressor—Gardner Denver driven by a Wisconsin gasoline engine. The complete unit weighs 43,750 lbs with both water, lube oil and 275 gallons of fuel in the tank. The weight is so distributed that the unit can operate over the highways in Pennsylvania without special permits when hauled by a single axle highway trailer.

This is the Valley Rural Electric Co-operative's main office at Huntington, Pa.



Portable Caterpillar D397 Generator Set on location feeding power to high-line for Valley Rural Co-op consumers near Huntington, Pa.

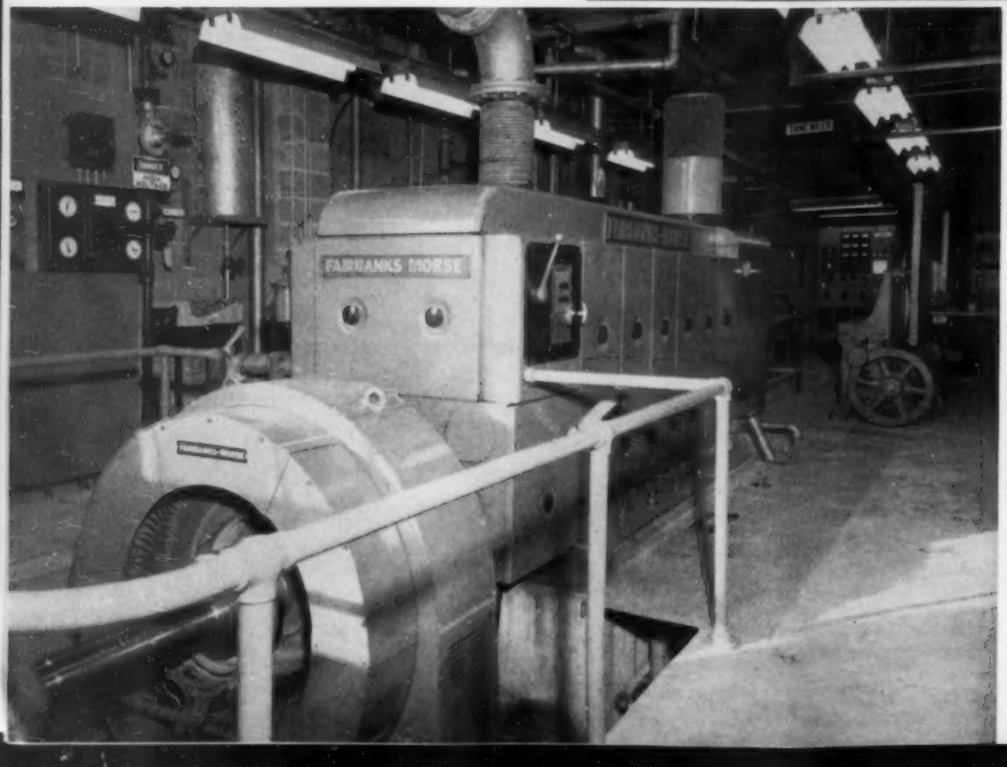
John H. Denton, Manager of Valley Rural Electric Co-op, Huntington, Pa., looks over the Caterpillar mobile electric set.

DIESEL SOLVES PRODUCTION PROBLEM

MOST modern factories need a continuous source of electric power to operate their machinery, but in the Radio Materials Corporation plant in Attica, Indiana, power dependability has an even deeper meaning. At least a quarter million ceramic condensers would have to be discarded if electric power failed during the firing process. RMC, with plants in Attica and Chicago, Illinois, is one of the world's largest producers of ceramic disc condensers for use in radios, television sets, electric razors, fluorescent light fixtures, hearing aids and other electronic equipment and holds to rigid standards of service and quality. To guard against interruption in power supply which could affect the product and disrupt production schedules, the company installed as its primary source of power a heavy-duty Fairbanks-Morse dual-fuel diesel driving a 265 kw alternator. There has not been a single interruption in service since the diesel went into operation in the summer of 1954.

RMC was founded in Chicago in 1947 by Joseph F. Riley and Richard Bourgerie to assemble radios and to manufacture coils and other radio parts. Since 1941 the partners had done initial research on the design and uses of ceramic condensers in

The Fairbanks-Morse 265 kw alternator is driven by the 360 hp F-M dual-fuel diesel to supply electrical power during operating hours in the RMC plant. On the left is the switchboard on which is mounted the F-M gauge and alarm panel for the big engine. The exhaust pyrometer is an Alnor, the governor Woodward, and the air filter, Air-Maze.



The Radio Materials Corporation plant in Attica, Indiana, installed a Fairbanks-Morse dual-fuel diesel to provide electric power for the manufacture of ceramic condensers. The modern plant has a company-owned and operated helicopter service, and a two-acre recreational lake for employees and guests has been constructed on the grounds.

the electronics industry, and a small pilot plant was constructed for their manufacture at Attica, Indiana, in 1949. This plant has been devoted exclusively to the manufacture and development of ceramic capacitors, and increasing demand has caused the factory to expand rapidly during the past six years. The Attica plant now has more than 800 employees and a new plant, constructed in Chicago in 1952, employs 600 more and houses the RMC general offices as well.

From the initial production operation to final testing of the capacitors, there are many complicated and power-consuming steps. Starting with a milling and drying operation, the material passes

through granulating, tumbling and mixing machines. Dried again, it is blended, sifted, and dried a third time. The body forms are pressed out and placed in kilns for firing, the most critical phase since the kiln temperature must remain absolutely constant during this period. The condenser plates are then applied to the ceramic bodies. After baking in electric ovens, the Discaps are assembled, an operation involving soldering and wiring machines. A protective coating is applied, and the condensers are sent to the identification department for sorting and marking. Another baking process is the final operation before the finished capacitors are sent to the testing department to be checked for power factor, capacity, leakage resistance and breakdown. Almost all machines used in manufacturing and assembling are electrically operated or controlled, and power failure would cause tie-ups along the entire line at great expense and considerable loss of time.

Although all steps in the manufacturing process are important, the most critical operation is firing the condenser bodies. The Attica plant has fourteen gas-heated kilns, half in operation while the others are cooled, unloaded, cleaned and loaded. Two of the kilns are able to carry as many as 250,000 Discaps a piece in a single load. Temperature in the kilns must be maintained constant at 2,400° F. during the firing process to obtain the necessary dielectric qualities, and individual thermostats regulate the heat through electrical controls. If the power supply were interrupted for just an hour, temperature variation would affect the properties of the material and the capacitors would be destroyed. Thus, all preliminary steps would have been wasted and all following operations would shut down until another batch had been fired. In addition to the direct monetary loss, this would mean failure to deliver an order on schedule with resulting inconvenience and loss to the customer. With many electrically powered machines and automatically-controlled electric ovens, there are sudden drops and rises in demand for electric power. Load requirements fluctuate sharply as much as 150 amps per phase. Company engineers report that the engine and governor take the swings easily.

Final testing of ceramic condensers in the RMC plant at Attica, Indiana, where product is checked for power factor, capacity, leakage resistance and breakdown. All machinery in the production and assembly of these condensers is electrically powered or controlled by the heavy-duty Fairbanks-Morse diesel-alternator.

Electric power to operate plant machinery was originally supplied by the local utility, but periodic service interruptions made it necessary for RMC to install an additional power source. In the summer of 1953, RMC decided that a heavy-duty engine would be best suited to supply the needed power capacity, to stand up dependably under the difficult variable load, and to provide production economy as a primary source of power.

The engine selected was a 6-cylinder, Model 31AD 8½ Fairbanks-Morse heavy-duty diesel with 8½-in. bore and 11½-in. stroke. Developing 360-hp at 514 rpm the diesel drives directly an F-M Type TGZO alternator rated at 265 kw. This unit provides 3-phase, 4-wire, 120-208 volt current to operate plant machinery, and has handled up to 1000 amps. The two-cycle diesel was originally installed as an oil-burning engine, and was later converted to dual-fuel operation to take advantage of the cheaper natural gas piped into the Attica area. At the present time the Fairbanks-Morse unit is the primary source of production power and must be in operation if the plant is to generate enough electricity to supply the demands of production equipment. Currently, the engine is in operation 18 hours a day, five days a week. The old diesels are operated during weekends and night hours when the production equipment is not in operation, and are also used for standby service. Experience has justified the dependence upon the big engine for working power. Since this diesel has been in operation, there has not been a single interruption in power service in the Attica plant. In addition, substantial savings have been effected in power costs because of the efficient dual-fuel operation of the heavy-duty engine. RMC is now protected against costly stoppages on the assembly line and orders are delivered on schedule.

List of Equipment

Engine	Fairbanks, Morse Model 31AD 8½, 360-hp, 6-cylinder, 514 rpm dual-fuel diesel
Alternator	Fairbanks, Morse
Governor	Woodward
Fuel level meter	Levelometer Liquidometer
Lube Oil	Standard Oil Company (Indiana)
Fuel filters	Purolator
Lube full flow filter	Cuno
Lube cooler	Ross
Heat exchanger	Ross
Thermostatic valves	Fulton Sylphon
Exhaust silencer	Maxim
Intake air filter	Air-Maze
Gauges	Marshalltown
Pyrometer	Alnor
Alarm panel	Viking
Electrical meters	Burlington Instrument
Cooling tower	Binks

TWIN DISC'S 1300 SERIES TORQUE CONVERTER

By W. L. BODE

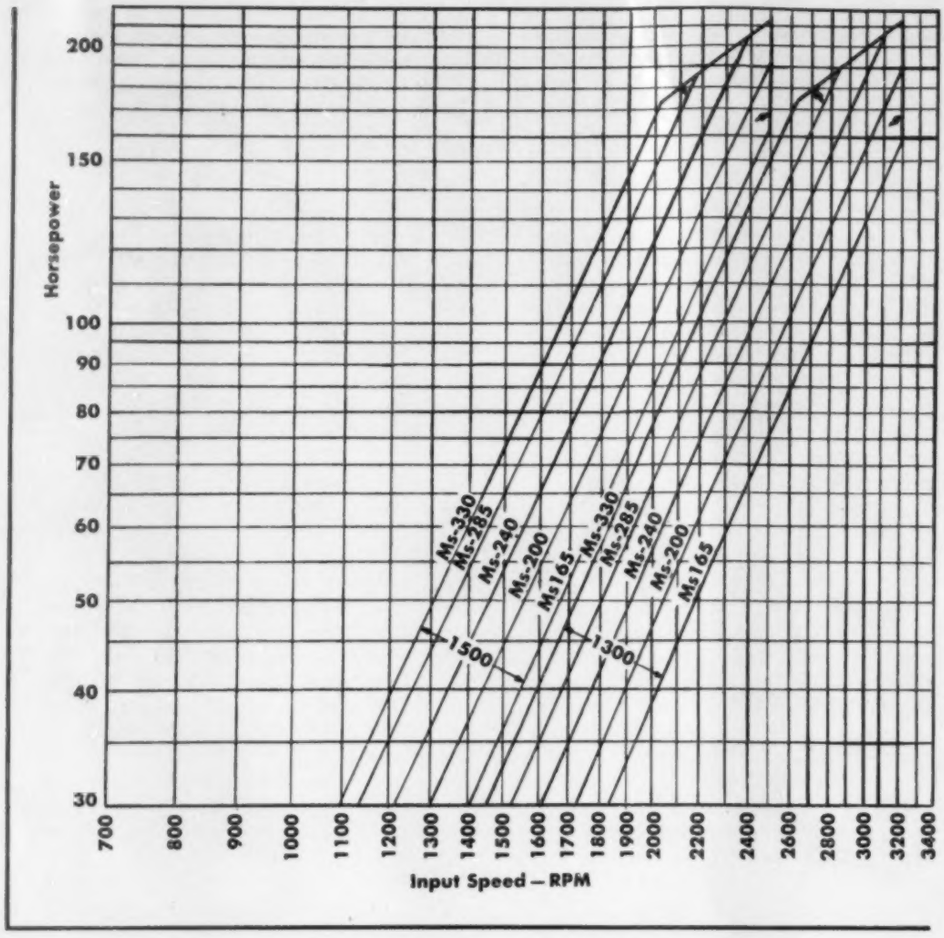
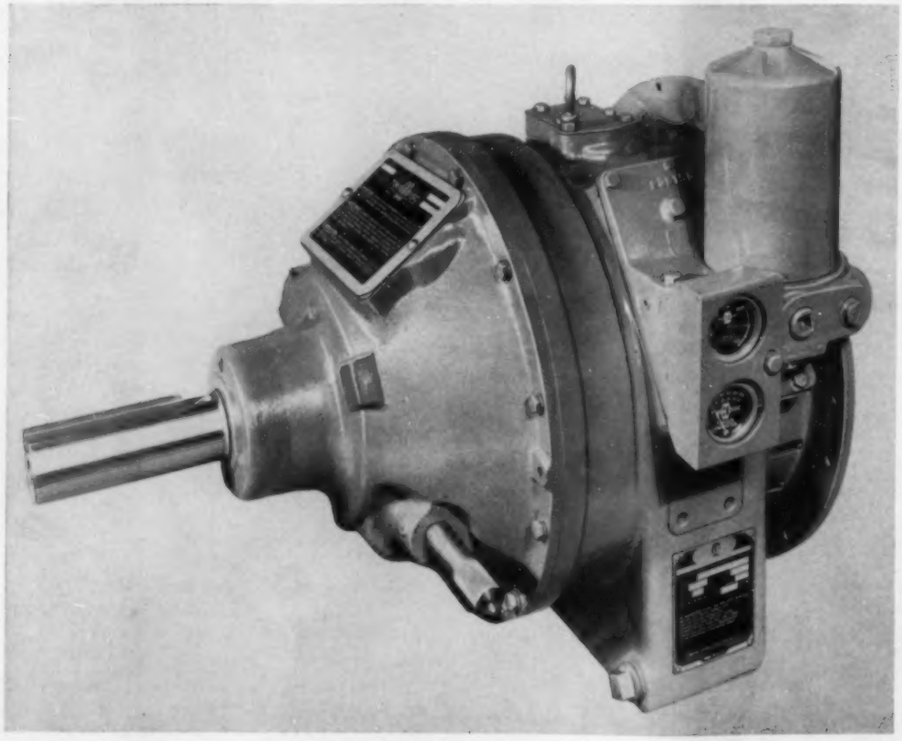


Fig. 1 - Comparison of hp and rpm capacities of Twin Disc 1500 Series and 1300 Series single-stage torque converters.

Twin Disc 1300 Series single-stage torque converter equipped with power take-off.



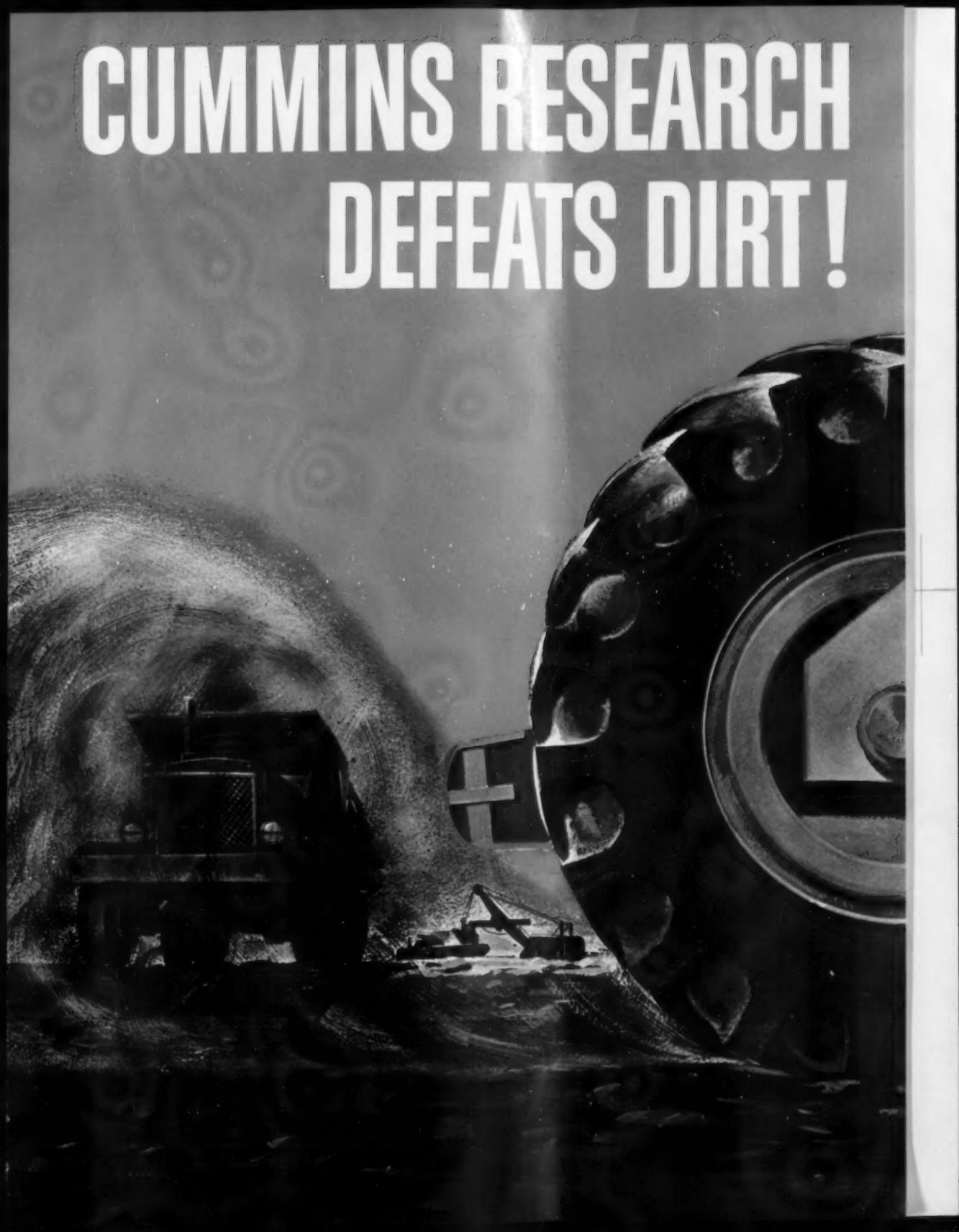
CLOSELY following the introduction of the 1500 Series single-stage torque converter, Twin Disc Clutch Company has announced a new 1300 Series Single-Stage unit designed for high-speed diesel engines. Applications lending themselves to the new torque converter are shovels, front-end loaders, industrial hoisting machinery, road rollers, graders and a multitude of others where single-stage torque converters may have advantageous characteristics.

The 1300 Series torque converters are for engines producing from 30 hp at 1450 rpm to 212 hp at 3200 rpm. Figure 1 shows the input hp and speed throughout the converter's entire range. Specific torque ratings are 165, 200, 240, 285 and 330 lb-ft, depending on the impeller blading selected by the user. Maximum input torque is 350 lb-ft.

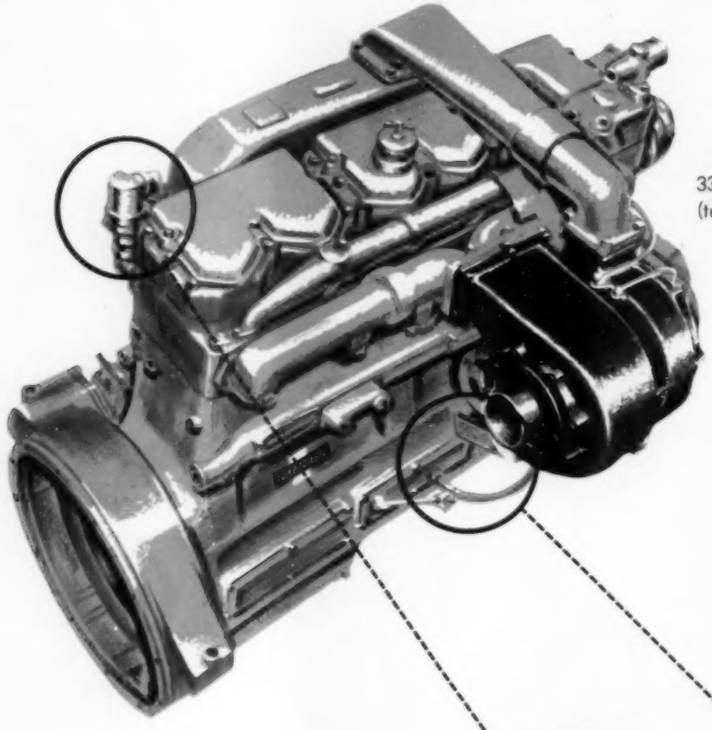
Characteristic of Twin Disc's single-stage design, the 1300 Series unit features unloading of the engine through a blade design wherein the turbine develops a counter-head which stops fluid circulation at high speed ratios. This simplifies construction by eliminating use of free-wheeled stators.

Another important design feature is that impellers having different bladings (both number of blades and pitch) are interchangeable. Thus the 1300 Series converters can be matched as accurately as possible to engines of various hp outputs and speeds, within rated limits, without requiring changes in the converter housing or other components. This, of coure, considerably reduces the number of parts required for replacement if the converter should be damaged in the field.

Production of the Twin Disc 1300 Series currently consists of one model—the Model F. This is a spacer-type arrangement with an SAE No. 2 engine flywheel housing size and an SAE No. 2 or 3 output housing. Combined with the Twin Disc 1500 Series models, the 1300 Series units bring to industrial equipment manufacturers and users a line of single-stage torque converters with a continuous range from 30 hp at 1100 rpm to 212 hp at 3200 rpm. The range is further broadened by Twin Disc's line of three-stage torque converters, which have capacities running from 40 hp through 1000 hp. For further information on Twin Disc Torque Converters, write Twin Disc Clutch Company, Hydraulic Division, Rockford, Illinois.


CUMMINS RESEARCH
DEFEATS DIRT!

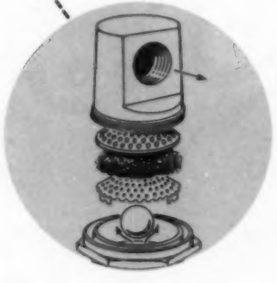
ANNOUNCING NEW CUMMINS

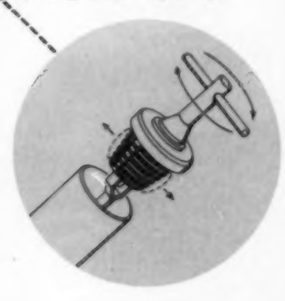


335 h. p. *TURBODIESEL*® Engine (turbocharger side)

2. New Airtight Dipstick Cap

"Bottle-stopper" twist-on cap forces rubber washer to expand . . . making this opening completely airtight.





1. New Crankcase Pressurizing

Cummins-developed valve keeps crankcase pressurized to prevent dirt-filled air from entering engine. Standard on supercharged and turbo-charged engines.

Cummins Oil System . . . *defeats dirt!*

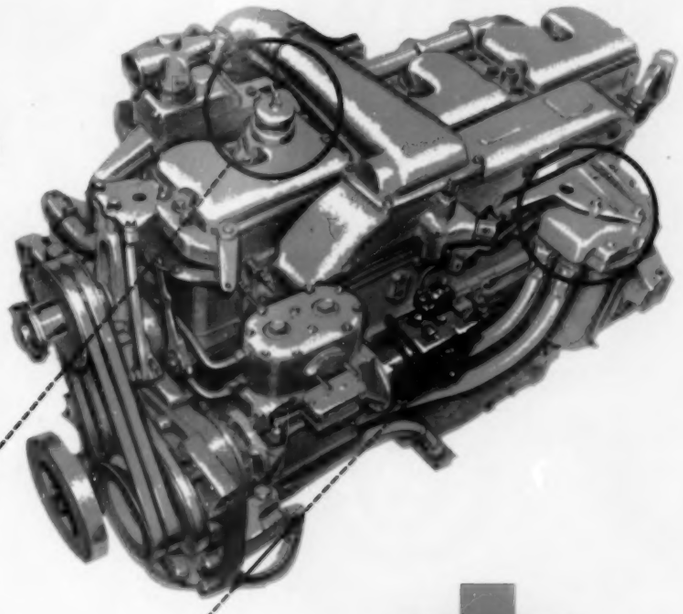
Cummins developed Crankcase Pressurizing (1) builds a predetermined amount of pressure *inside the engine*. This *low* pressure keeps dirt from entering at loose seals, worn gaskets and loose connections. New air-tight dipstick and oil filler caps (2 and 3) give positive seals against dirt and abrasives. Cummins specially designed oil filter (4) gives complete, continuous oil filtration and is more efficient in capturing and holding engine-damaging impurities.

Cummins Air-Induction System . . . *defeats dirt!*

A secondary way dirt enters an engine is through the air intake system. The following Cummins *firsts* (see right), coupled with the oil bath air filter, give maximum protection against dirt: (A) specially developed "hump" hose; (B) airplane-type clamps; (C) 90° molded rubber hose; (D) stainless steel welded tubing; (E) newly designed dry-type air filter. Cummins Air-Induction System provides the most modern and efficient protection available against the effects of dirt.

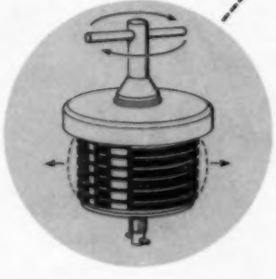
DIRTPROOFING SYSTEM

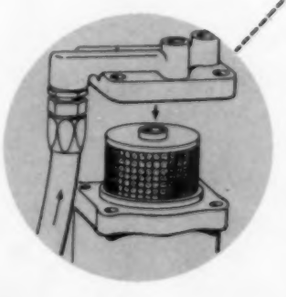
335 h. p. *TURBODIESEL*® Engine
(fuel pump side)



3. New Airtight Oil Filler Cap

"Bottle-stopper" twist-on cap provides seal at oil port against dirt and grime.



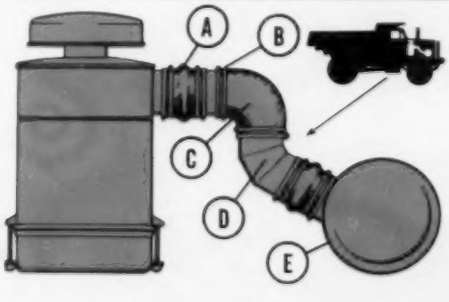


4. New Oil Filter

Cummins improved oil filter: (1) allows freer passage of lubricating oil, and (2) captures and holds more dirt.

CUMMINS

MORE PROFIT



Cummins Fuel System...
defeats dirt!

Dirt sometimes makes its way into diesel fuels, subjecting the moving parts in the fuel system to excessive wear. Here, too, Cummins has developed superior protection for construction diesels. The PT system's fuel filter eliminates harmful contaminants . . . keeps dirt from entering the fuel system . . . passes through dirt-free fuel. Cummins new dirtproofing system is just another reason why more and more contractors specify their power and *Standardize on Cummins!*

Cummins dirtproofing accessories are available in kit form right now! Your Cummins Distributor can convert models in the field with minimum delay. He can also arrange for you to see the new 28-minute film, "Operation Hourglass," showing how Cummins research has overcome the devastating effects of dirt on diesels. Defeating dirt is another great Cummins achievement. It's just one more reason why, for the last 25 years, Cummins has led in the development of high-speed, lightweight diesel power for automotive, industrial, construction and marine users.

Cummins Dirt Protection features are available on heavy-duty construction equipment made by:

TRUCKS
Autocar
Cline
Cook
Crane Carrier
Dart
Diamond T
Euclid
Federal
Four Wheel Drive
Hayes
Hendrickson
International
Kenworth
Mack
Oshkosh
Pacific
Peterbilt
Reo
Sicard
Walter
White

PAVERS
Koehring
Worthington

SHOVELS, DRAGLINES, CRANES, HOISTS
American
Bay City
Bucyrus-Erie
Clyde
Dominion
Gradall
Industrial Brownhoist
Insley
Koehring
Lima
Link-Belt
Manitowoc
Marion
Ohio Locomotive
P&H
R. G. LeTourneau
Thew
Wellman

COMPRESSORS
Worthington

SCRAPERS
Euclid
International
LeTourneau-Westinghouse
Michigan
M-R-S
Wooldridge

LOCOMOTIVES
Baldwin-Lima-Hamilton
Canadian Locomotive
General Electric
Plymouth
Vulcan

COMPACTORS
Buffalo-Springfield

LOADERS
Clark
Eimco
Michigan
Pettibone-Haiss
Scoopmobile

TRACTORS, DOZERS
Eimco
LeTourneau-Westinghouse
M-R-S
Wagner
Westfall

CRUSHERS
Bros
Iowa
Rogers
Universal

DRILLS
Bucyrus-Erie
Reich

PULVERIZERS
Bros
Pettibone-Wood

GRADERS
Adams
Galion
Huber-Warco

AUGERS
Compton

CUMMINS ENGINE COMPANY, INC. COLUMBUS, INDIANA

EXPORT — CUMMINS DIESEL EXPORT CORPORATION — COLUMBUS, INDIANA, U. S. A. — CABLE: CUMDEX
OVERSEAS FACTORY — CUMMINS ENGINE COMPANY LIMITED — SHOTTS, LANARKSHIRE, SCOTLAND — CABLE: CUMSCOT

DIESELS ON THE MARCH

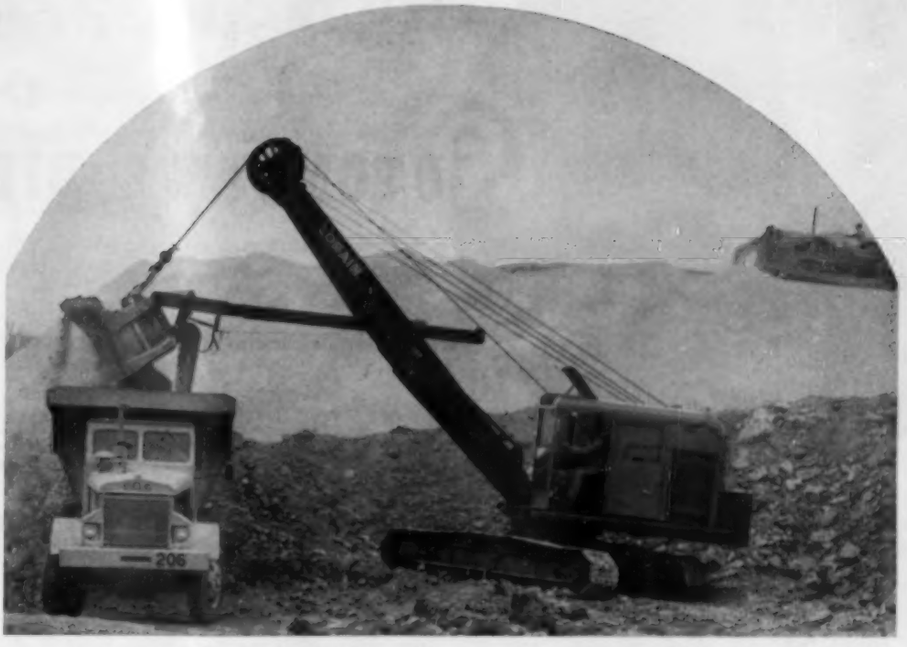
By L. H. HOUCK

THE Greatest Show On Earth pales to insignificance beside the Diesel Parade that has just been started by the $57 billion Interstate Road System program. Where it will end will be a question answered by the next generation with: "They went that away!" The American Road Builders Association has prepared some estimates of the equipment that will be needed but already estimates of the $57 billion road cost and equipment have been greatly increased which makes these figures ultra conservative. More than 57,000 new units of road building equipment will be needed for each $1 billion worth of highway above $5.8 billion.

Of this number there will be 22,000 trucks, probably 90 per cent diesel; 3,000 cranes, shovels and draglines, probably 100 per cent diesel; 13,000 scrapers and motor graders, diesel; 4,500 crawler type tractors, diesel; 3,000 2-wheel and 4-wheel tractors, primarily diesel. All of this per $1 billion units of construction, thus indicating that the conservative figure of the market for the 13-year period of the interstate highway construction program figures out at more than 3,000,000 new units of power equipment, mostly diesel-equipped. This figure is, of course, just for the new jobs just starting in most states and does not cover the ordinary replacement market or the normal expansion of growth market.

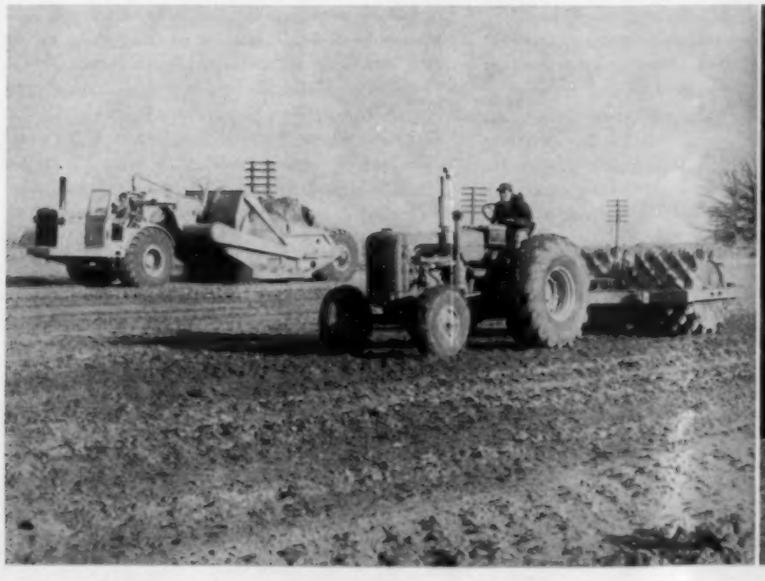
Although the new federal interstate highway program is booming throughout the country, there are still those who do not yet realize its significance. It came into being on July 1, 1956 when President Eisenhower signed the act creating the Federal Aid Highway Act of 1956. Basically this act proposes to match state funds on a basis of 90 federal dollars to 10 state dollars for improved two and four lane highways across the country, east, west, north and south, with limited access. A motorist can pick up the colors of the highway he wishes to follow to California, for instance, and drive the entire way at high speeds without a stop light or a crossing. It is the answer to high speed modern cars and high horsepower. Missouri was the first state in the union to grant contracts under the new law. They had two ready when the Act was signed and thus gained fame by being the first state to let a construction contract and the first state to let a paving contract. As of January 1, 1957, more than $100 million in contracts had been let and in 6 months the figure will be doubled.

This is the greatest and the biggest road building project in the history of the world—a job that might have been master-minded for a test of diesel stamina and power. The program is designed for simultaneous completion in all states in 13 years so that there will be no dilly-dallying or great open stretches of bad highway. Highway and construction estimates say that when it is completed, that the highly geared construction industry, will just have a good start on even greater programs which will start at that time. That's the roadbuilding market for diesels and it's a job that can only be done with diesels.



Scenes like this will be reenacted by the thousands all over the country. Three diesels in the picture are a GMC in the Euclid, a Cummins in the late model Lorain shovel, and the dozer on the aggregate pile is a Caterpillar.

Case 520 diesel tractor pulling sheepfoot roller is a relatively new use of rubber-tired industrial tractors for such jobs on the highways. In background is GM diesel-driven Euclid scraper.



Allis-Chalmers grader with Allis-Chalmers (Buda Division) diesel smooths the way for future generations.

AUTOMOTIVE DIESEL PROGRESS

A COMMENTARY BY **MERRILL C. HORINE**

Merrill C. Horine, for 38 years a member of the Society of Automotive Engineers, has been actively engaged in automotive engineering, sales promotion and training, advertising and editing of automotive publications since 1907. He has contributed numerous papers on diesel and allied subjects to the SAE and other organizations. An officer in the Air Service in World War I, he was a consultant to the Chief of Ordnance and the Automotive Division of the War Production Board in World War II.

Turbocharging, Now and In The Future

SUCCESSFUL beyond any question, turbocharging of automotive diesels is rapidly displacing mechanically-driven superchargers, as predicted in this column of the September, 1955 issue of DIESEL PROGRESS. Up to that time the turbocharger had been applied only to four-stroke automotive diesels; but since then it has produced comparable results when applied to two-stroke types. Here, of course it has not replaced the mechanically-driven Roots-type charging blower; but merely supplemented it. Advances made in turbocharger application to both four- and two-stroke automotive diesels are the results of a great deal of patient and painstaking research, experimentation and development, out of which has come a better understanding of the problems and requirements which beset its adaptation.

That this work has been well done is proven by the results which have been achieved. For the same brake mean effective pressure, turbochargers produce markedly superior fuel economy to that obtainable with comparable Roots blower supercharging; equal, in fact, to that of their naturally-aspirated counterparts. As compared with the latter, however, they show brake mean effective pressures of up to 140 pounds per square inch, contrasted with little more than 100. This, of course, is the means by which they increase specific horsepower, that is, horsepower per cubic inch of piston displacement.

Acceleration

Acceleration remains the biggest problem. Turbocharged engines simply do not pick up speed and load as rapidly as the others and much study and experimentation is being devoted to the solution of this problem. However, the characteristic hesitation and burst of smoke is usually of short duration and seems to make little difference in overall performance, even in buses, where it is, of course, a major factor. Doubtless the well-known accelerative boost afforded by the torque converter in city buses, contributes to this result.

Contrary to fears which were entertained in the early stages of the development, the turbocharger has not produced the expected difficulties with engine bearings, save in a few instances. While undeniably the higher brake mean effective pressures produced do increase maximum bearing pressures, the rates of pressure rise appear to be somewhat lower, owing to the superior combustion smoothness attendant upon higher compression pressures. It is generally conceded that the rate of pressure rise is a more important factor relative to main and connecting rod bearing behavior than is the maximum pressure reached.

Experience emphasizes the necessity of closely matching the characteristics of the turbocharger to those of the engine as regards the blade angles of the turbine and blower wheels and particularly those of the nozzle ring. Diffusers appear necessary on the blowers of some applications and to contribute too little to be necessary on others. Intercoolers, so far, have not been found essential on most automotive applications; but as the effectiveness of turbocharging is increased, may prove desirable in many cases.

Future Improvements

Possibilities for future improvement of turbochargers are found in adjustable blade angles of nozzle rings and even diffuser rings to procure greater efficiency at the constantly-varying load on the engine. These have not appeared essential in the turbochargers for large stationary, marine and railroad diesels because of their relative constancy of load; but seem to hold considerable promise for automotive application, provided they do not involve undue complication and cost. This is because the centripetal turbine, like the centrifugal blower, exhibit their maximum efficiency within a narrow range of speed and pressure, whereas the automotive engine must adapt itself to a broad and frequent variation of both.

Improving Acceleration

Such a development should certainly assist in improving the accelerative performance and reduce smoking under such circumstances. To improve starting, where a higher rate of supercharge is imposed, thereby necessitating a reduction of compression ratio, much thought is being given to the practicability of two possibilities: First of these is some simple and reliable means of changing the compression ratio in the starting and possibly idling stage, when the turbocharger delivers little if any additional air. The second is some form of external drive for the turbine in starting, to bring the compression pressure up to good starting requirements. Such external drive might be mechanical, from the engine, working through an overrunning clutch. It might be an electric motor, a compressed air engine or even a small gas turbine. Such developments may be far in the future, if they materialize at all.

Injection Requirements

To secure the benefits of the higher volumetric efficiency, which is the prime purpose of a supercharger of whatever type, it is of course essential to supply a corresponding increase in the amount of fuel injected. At the same time, the minimum injection volume must be maintained. This means that the injection system must be capable of a broader range of metering to the nozzles, while still maintaining a satisfactory spray pattern throughout the range. Conventional injection systems are somewhat limited as to range and considerable work is indicated to bring them up to the exactions to be expected in future turbocharged engines. Perhaps this will be accomplished by the use of a greater number of spray orifices of smaller size, by a greater range of injection pressures or by longer duration of injection at the high end. Something must be done to avoid overinjection in idling, acceleration and starting, while providing the full quantity required for maximum performance. There appear to be possibilities in an auxiliary injection metering control sensitive to supercharge pressure.

While turbocharging of automotive diesels may be said to be still in its infancy, it is a demonstrated success. Although the problems pointed out above, as well as others now recognized or yet to arise, indicate that a great deal of research, invention and development remain to be done, every indication points to alluring probabilities in the future for turbocharging.

TURBOCHARGING THE SERIES 71 ENGINE

Excerpts and Comments by Arnold B. Newell on an Interesting Paper Given by J. J. May and V. C. Reddy of the Detroit Diesel Engine Division of General Motors Corp. at the SAE Annual Meeting in Detroit on January 17.

THE work of Dr. Buchi proved the practicability of turbocharging and since this knowledge has been available for over forty years, turbocharging has not been spontaneous. It has been far more rapid in 4-cycle than in 2-cycle engines. Development of commercially available turbocharging for automotive diesels has been quite recent. A number of years ago the Detroit Diesel Engine Division made some investigations to determine power recoverable from the exhaust of the 6-71 but the results were not very promising and the project was temporarily shelved because of projects associated with military applications. Some tests were run by the Navy and the Lanova Corporation did some excellent work in 1952. By May 1953 they conclusively proved that appreciable gains in power and economy could be attained. The Detroit engineers followed closely the Lanova tests and in January 1953 negotiated with the Elliott Company to obtain two turbochargers of a size they hoped would be suitable for the 6-71.

Surprisingly short tests indicated that pure turbocharging and a parallel system would not work. However, on the second test day operation with the turbocharger and the Roots blower in series appeared to be the most satisfactory combination and with modifications it still is. They found that maximum permissible speed of the turbocharger was a controlling factor in output speed limitations of the engine; that back-pressure caused by the turbine nozzle resulted in loss in light load performance; though power could be increased no great improvement in economy could be expected; the engine apparently needed greater breathing capacity and peak combustion pressures were higher than desired. A 50 percent reduction in Roots blower capacity was too great and a 33 percent reduction produced better results.

The results of preliminary performance tests were so encouraging a comprehensive program was established for complete investigation of the turbocharging process and its effect on the life and the operating conditions of the engine. A test was set up to calibrate the turbocharger using the engine as a gas producer for the turbine and discharging the compressed air into a plenum chamber. By controlling engine speed and load the turbine speed could be controlled and the compressor calibrated and charted as shown in Fig. 1, wherein location of the work line is shown by AA as satisfactory matching of the engine and compressor—BB and CC represent two types of unsatisfactory matching of engine and compressor—BB represents operation too close to the surge line at limit of stable operation and CC portrays incorrect matching where compressor is operating at a range of low adiabatic efficiency. Line AA can be considered optimum. This test revealed a maximum power output available from the turbine of 43 hp at 2500 engine rpm, but high exhaust back-pressure created by the turbine nozzle seriously increased the Roots blower power requirements and decreased engine output.

While the turbocharger was being calibrated a similar non-turbocharged engine was tested with a series of blower drive ratios from .55 to 1.5 which revealed that even with a scavenging air ratio of less than one, no loss of minimum fuel economy resulted. Although no major changes in scavenging efficiency resulted from decreased air supply, ability to accelerate started deteriorating at the 1.075 scavenging ratio but was considered satisfactory at 1.19. Exhaust condition was satisfactory with all blower ratios as long as an overall fuel ratio of 30 to 1 or above was employed. Nineteen percent excess air was selected for the turbocharged engines and proved optimum for turbochargers with an overall efficiency in the 50 percent range.

While shorter Roots blower rotors with the original 2:1 drive and reduced speed of the standard blower gave the desired capacity, for reasons of interchangeability with non-turbocharged engine components, a blower incorporating a self-contained reduction gear was decided upon. To more accurately match turbocharger to engine, an adjustable nozzle ring was produced to fit the Elliott Model M-10 compressor. The nozzle area could be varied from 75 to 125 percent and this proved useful in checking optimum nozzle area for any desired rating.

Torque characteristics of 2-cycle engines are not desirable when high torque at low speed is required. In general the higher the speed and power of the turbocharged 2-cycle engine, the less the torque characteristics under drooping torque curve. Although the variable nozzle would be desirable from the performance standpoint, mechanical and economical problems prohibit its use at present. In the non-turbocharged engine torque increase at any fixed speed is practically instantaneous when the throttle is opened but the turbocharged engine must wait on the turbine getting up to speed. The 71 engine torque response is affected by the Roots blower drive ratio for delivering excess air independently and by the mass of the rotating parts of the turbocharger. With lighter parts acceleration is faster.

6-71 turbocharged marine engine. Compressor air inlet housing design permits compactness with very little restriction. This is blower side of the engine.

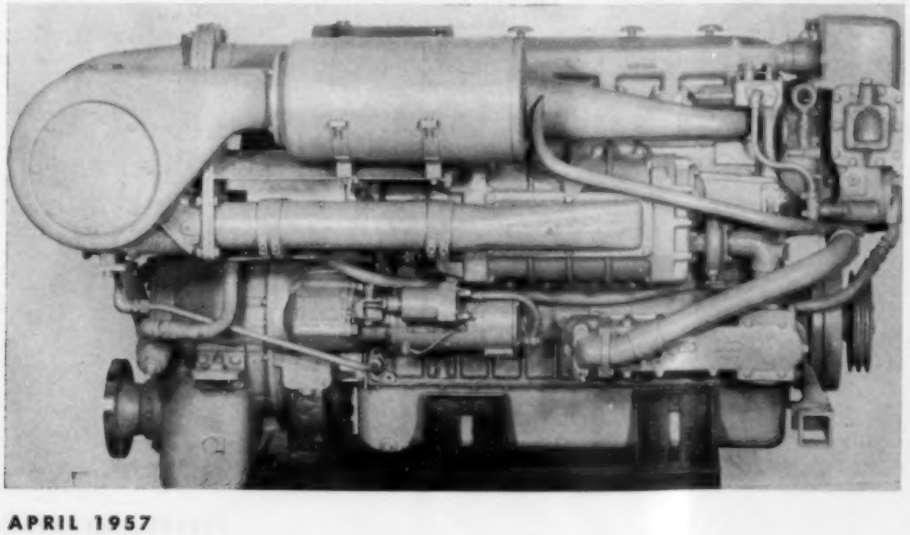
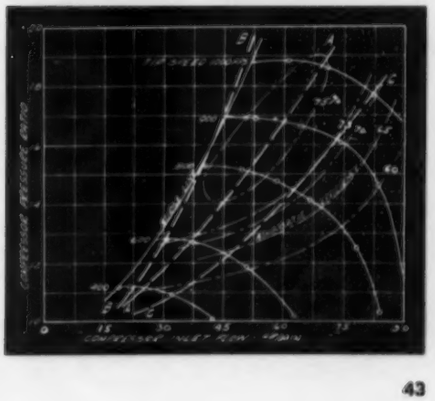


Figure 1—Compressor Themodynamic Performance.



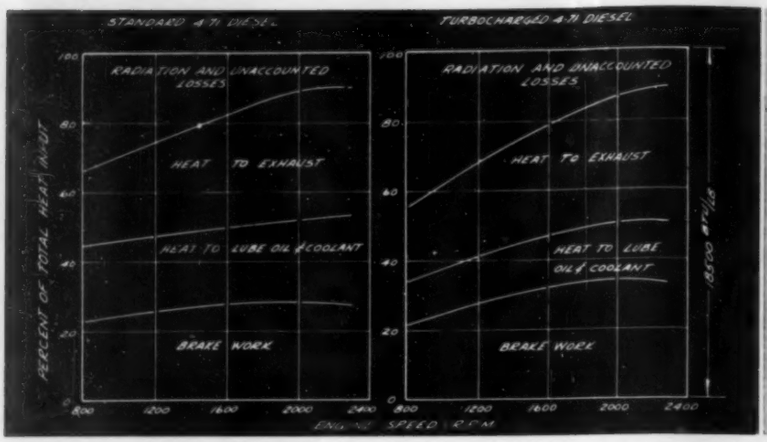
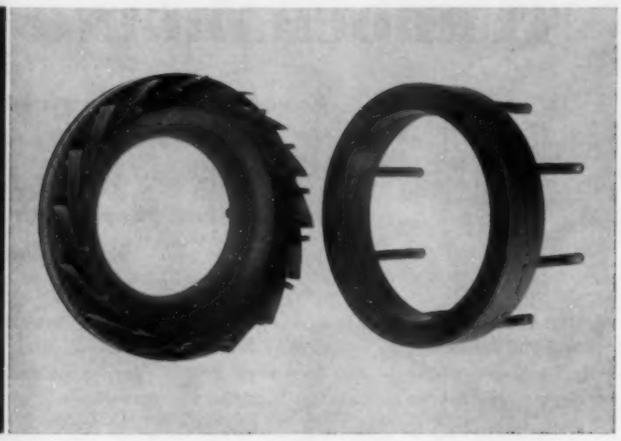


Figure 2—Comparative heat balance of Turbocharged and a Non-Turbocharged diesel.



Adjustable nozzle ring designed and built to fit the Elliott model M-10 compressor and serving as a useful tool in checking the optimum nozzle area for any desired rating.

Overall efficiency of the turbocharger appears to be the major item that correlates directly with engine performance. Peak overall efficiency varies from 48 to 60 percent. Interconnected problems of matching turbine to compressor and the Roots blower to the turbocharger and the combination to the engine can be quite complex. It is felt the higher the overall efficiency the greater the possibility of improving engine performance. The turbocharger can readily be used to improve power and economy and less readily used to improve economy without changing power. It would not be difficult to increase both air and fuel thus further increasing power output. Among final factors determining engine rating were: engine life, stability, combustion peak pressures, thermal loading, cost, weight and available market. Higher engine speed was desirable because it permitted use of existing torque converters and clutches of limited torque capacity.

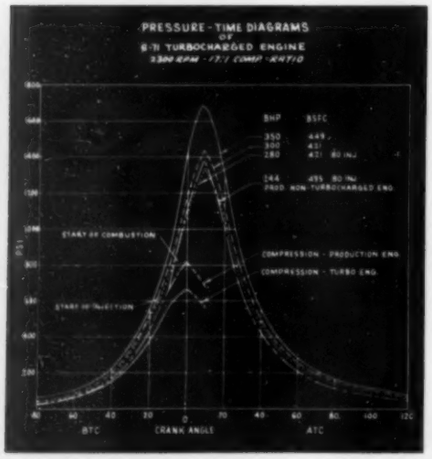
Figure 2 shows a heat balance diagram of a turbocharged and a non-turbocharged engine at equal fuel rates. Comparative heat rejection data at 3200 rpm is as follows:

	Heat to Exhaust	Heat to Oil & Water	Brake Work
Turbocharged	42.3%	23%	32.9%
Non-turbocharged	37.0%	25%	28.2%

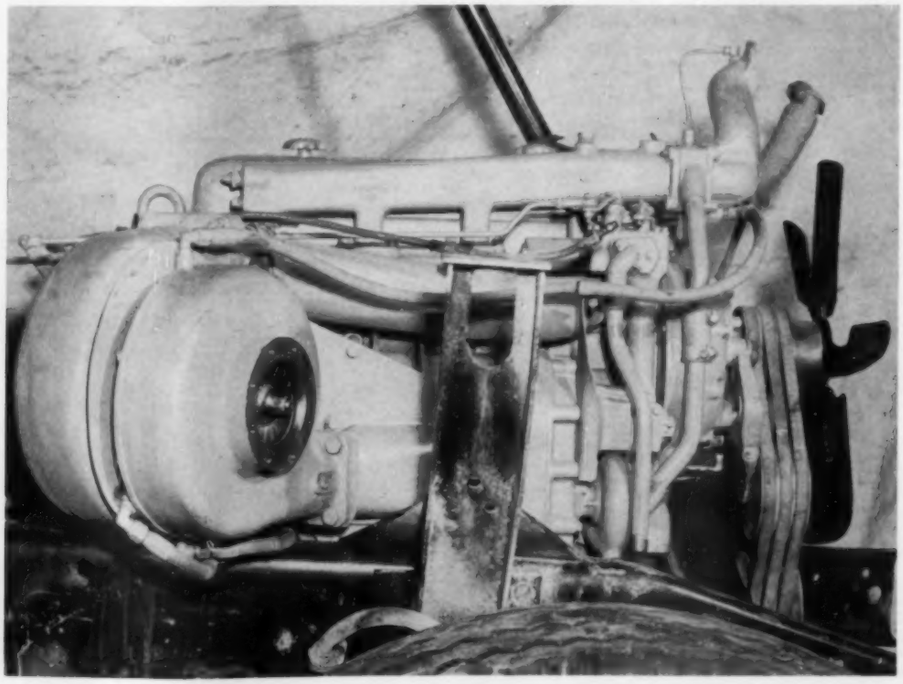
This data reveals increase in heat rejection to exhaust and decrease to the cooling water which simplified the problem of cooling the turbocharged engine. Stability was appreciably affected by reduction in compression ratio and 17:1 was maintained. Indicator cards from the turbocharged engine at 2300 rpm are shown in Figure 3. Selected rating peak pressures were satisfactory and higher outputs could be used without excessive pressure. Only moderate increase in bearing loads were revealed. Apparently the number four bearing increased rather rapidly with stepped up bmep due to the crank arrangement but the actual load on this bearing was normally low at 350 bhp and is less than 1000 psi. A 50 percent increase in bmep would not increase bearing loads beyond acceptable limits.

If the turbine is operating at maximum safe speed and temperature at sea level, continuous high altitude operation can cause trouble. The solution seems to be to reduce fuel input thus reducing turbine speed and temperature in addition to engine output at sea level. All applications must be carefully considered and rated accordingly. Turbocharging tends to reduce the exhaust noise level but the muffler cannot be eliminated even though

Figure 3



A 4-71 turbocharged engine truck installation. This arrangement permits the same engine model to be used in either the conventional or the cab-over engine trucks.



its use tends to increase back-pressure objected to by turbocharger engineers. Since the turbocharger does some silencing a straight through type muffler with minimum restriction provides satisfactory noise control. A gain in performance and reduction in peak pressures can be obtained by intercooling with an intercooler placed between the compressor and the Roots blower. However, full benefit is not obtained since temperature differential is much greater when an intercooler is used. Normal warmth of the air box tends to raise the temperature of the air when an intercooler is employed while without the intercooler the low heat of the air box tends to lower incoming air temperature. Tests indicate that turbocharging has little effect on the life of main and connecting rod bearings. The aluminum co-plated bearings had life considerably in excess of the normal engine overhaul period.

Exhaust valves appear to be a critical item in life of the turbocharged 2-cycle engine. The life of production exhaust valves made of jet blade N-55 alloy was considerably shortened by turbocharging. This was confusing as temperatures of exhaust were about the same as in non-turbocharged engines. However, in tests with Silcrome No. 1 alloy valves which indicated their operating temperature by a reduction in material hardness showed considerable higher valve temperature existed, perhaps due to greater density of exhaust gases resulting from pressure restriction of the turbocharger. A number of high temperature alloy valves were evaluated in the turbocharged engine before valves made of Nimonic 90 material were released for production engines. This is a nickel base alloy developed for gas turbine blades.

Other than exhaust valve life, turbocharging appears to have little effect on the life of the engine. Currently some Series 71 engines have been operating in the field 1500 hours or 100,000 miles and while some failures have occurred during field tests, practically all resulted from difficulties associated with getting the four valve head into production. It is believed that the Series 71 engines will be economical and reliable units for those applications requiring maximum power with a minimum of size and weight.

Only a few of the problems of the turbocharged 2-cycle engine have been discussed. Improved turbochargers with higher pressure ratios are in the development stage. With them will come engines of higher output per cubic inch of displacement and still higher thermal efficiencies. As yet only a beginning has been made in turbocharging 2-cycle automotive diesels. The possibilities are almost limitless. The number of such engines is increasing and successful performance will greatly extend their future use.

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New Luxury Diesel Yacht

Twin Mercedes-Benz 500 hp diesel engines power the new luxury yacht, *Westlake II* (above). The craft was built in the Abeking & Rassmussen Shipyard, of Bremen, Germany. Henry Doelger of San Francisco, California, the $500,000 yacht's owner, accepted delivery of the *Westlake II* recently. Equipped with the latest safety devices and modern luxury appointments, *Westlake II* is capable of speeds up to 14 knots. Her dimensions are 118 ft in length and 22½ ft in beam.

Mechanical features of the craft are: two Mercedes-Benz diesel generating plants, radar, direction finder, gyroscope system, electric-hydraulic rudder system, electric anchor windlass, and two motor launches. The yacht's hull and superstructure are welded steel while interior decoration makes heavy use of stainless steel, tile, glass and various hardwoods. Living accommodations for 10 passengers and a crew of 7 are provided aboard this outstanding luxury cruiser.

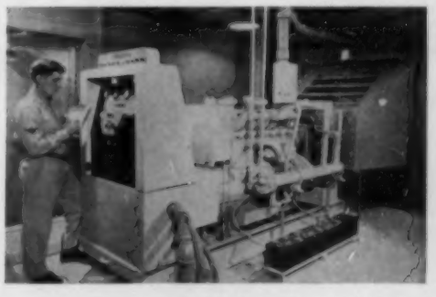
Automatic Generating Plant

A completely automatic diesel generating plant which thinks for itself, turns itself on and off, sends signals about operating conditions to technicians in a control center miles away and operates without manpower in attendance has been developed for use in radar systems in the United States. Designed by Consolidated Diesel Electric Corporation, the equipment, Con Diesel's Model 4000, powered with a 110 hp Allis-Chalmers Buda diesel features an electric brain and built-in Memory System. Delivery of the units is now being made to the Department of Defense, according to Con Diesel President Norman I. Schafler.

The compactly-packaged primary power units are designed for gap-filler radar stations—which cover gaps between main and auxiliary radar installations because of uneven terrain and other reasons.

The equipment powered by the Model 4000 provides a fence or alarm system between main and auxiliary stations. Con Diesel holds an Air Force contract for about $3 million to supply the completely automatic Model 4000 to four-fifths of all gap filler installations in the United States.

Because radar installations are designed to operate from commercial power supplies and lines where available, the power plants will stand in reserve or be used as a source of auxiliary power in regular operation. Normally, the power plant will include two diesel generator sets and a brain or power supply control. Each is completely automatic, designed to operate without personnel in attendance. In the event the normal power supply from commercial lines fails, weakens, fluctuates or otherwise ceases to provide steady and sufficient power for radar operation, the automatic power plant turns itself on and provides power to the full load in less than 12 seconds.



The control point for the Model 4000 may be many miles distant from the actual installation. The units constantly, through associated equipment, relay operational information back to the central control point. If, for example, one diesel generator set of the power plant ceases to operate at full capacity or fails because of insufficient lubricating oil—or any other malfunction—the second unit automatically turns itself on and assumes the load. At the same time, the inoperative unit returns itself to the standby position, turns itself off and relays back to the main control plant that it has failed and the reason for the failure. The Memory System which records control or mechanical deficiencies or failures in the units, indicates to technicians at the control point what repairs are necessary and what parts need adjustment or replacement.

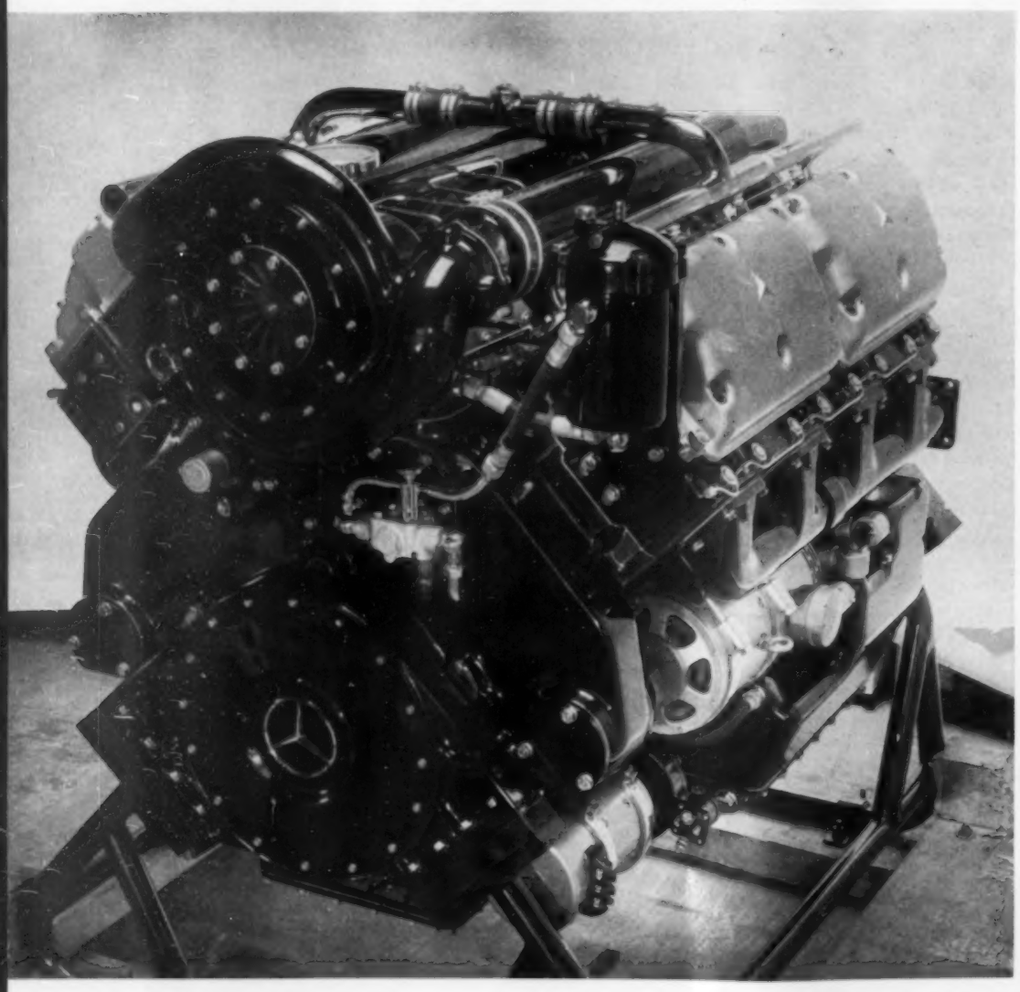
MERCEDEZ-BENZ 600 HP DIESEL

Weighing Only Five Pounds per hp, Output Is 11.5 bhp Per Cubic Foot of Engine While The bmep Is 120 psi and the Speed Is 2200. Arnold B. Newell Writes His Impression of This Engine Which, It Is Rumored, May Be Built Here.

ONE of the most extraordinary diesel developments in recent years is the type MB-837 Mercedez-Benz engine of remarkably low weight, compact design and 600 bhp output at 2200 rpm. In fact, so far as I know there is no other 4-cycle water cooled diesel equal to this one in all these respects. It measures 50 in. in overall length, 41.4 in. extreme width and the overall height is 43.6 in. The weight is about 3000 lbs or 5 lb per bhp and for each cubic foot of engine it delivers 11.5 hp. These particulars are for the complete engine with all accessory equipment but not including any form of power transmission attached to or driven by the engine. It is an 8-cylinder, 4-cycle V-type liquid cooled unit with 6½ in. cylinder bore, 6-57/64 in. stroke and 1830 cu in. displacement. The bmep is 120 psi. Supercharging is effected by a single-stage centrifugal blower gear-driven and mounted on the front of the engine with two outlets, one to each bank of cylinders. It is driven off the top of the gear train which drives the camshaft and other accessories. Cooling is by a closed system on the engine proper including water circulating pump and oil heat exchanger.

The major component is the block of special aluminum alloy forming crankcase and both cylinder banks. It carries eight cylinder liners, the crankshaft, two camshafts and a pair of cylinder heads. There is no structural reinforcement of steel. It also carries, attached to it all of the accessory equipment, covers and closures. There are five transverse webs in the block to carry the main bearing caps each held by four bolts. The same structure forms the outer water jacket and serves as a guide for the wet cylinder liners. Each bank of cylinders is capped by a cylinder head of aluminum alloy, held in place by 14 bolts conventionally arranged. In the cylinder head there is an opening for the insertion of a steel lined precombustion chamber insert carrying a welded-in burner at the lower end, the fuel injector at the top end and an electric glow plug on one side to assure easy starting under all conditions. There is a short annular passage from the precombustion chamber proper to the burner in which holes are drilled at the proper angle to distribute the fuel uniformly around the main combustion space between piston and cylinder head.

Looking at the front engine we see the gear train housing, supercharger blower and the hand pump for fuel priming. The Robert Bosch generator and the pre-start lube oil pump motor appears at the right. Large rubber pads for vibration isolation are shown at each front corner.

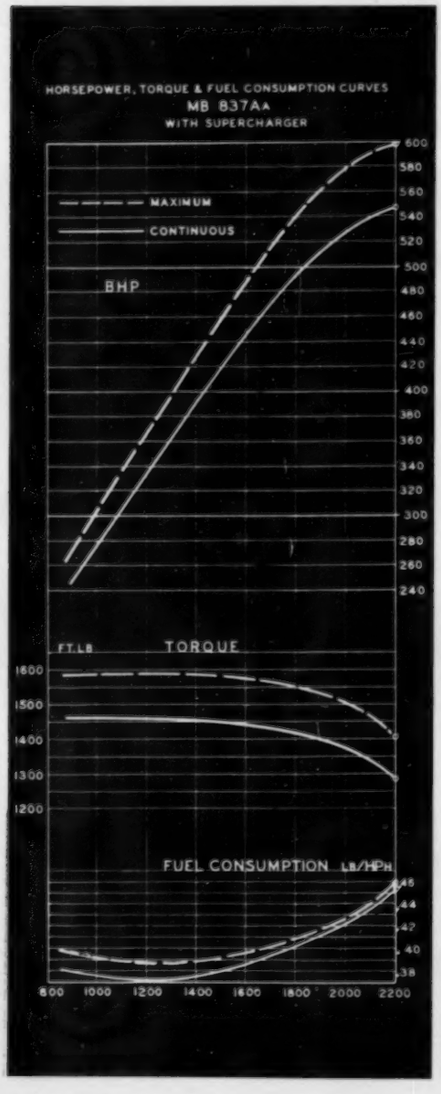


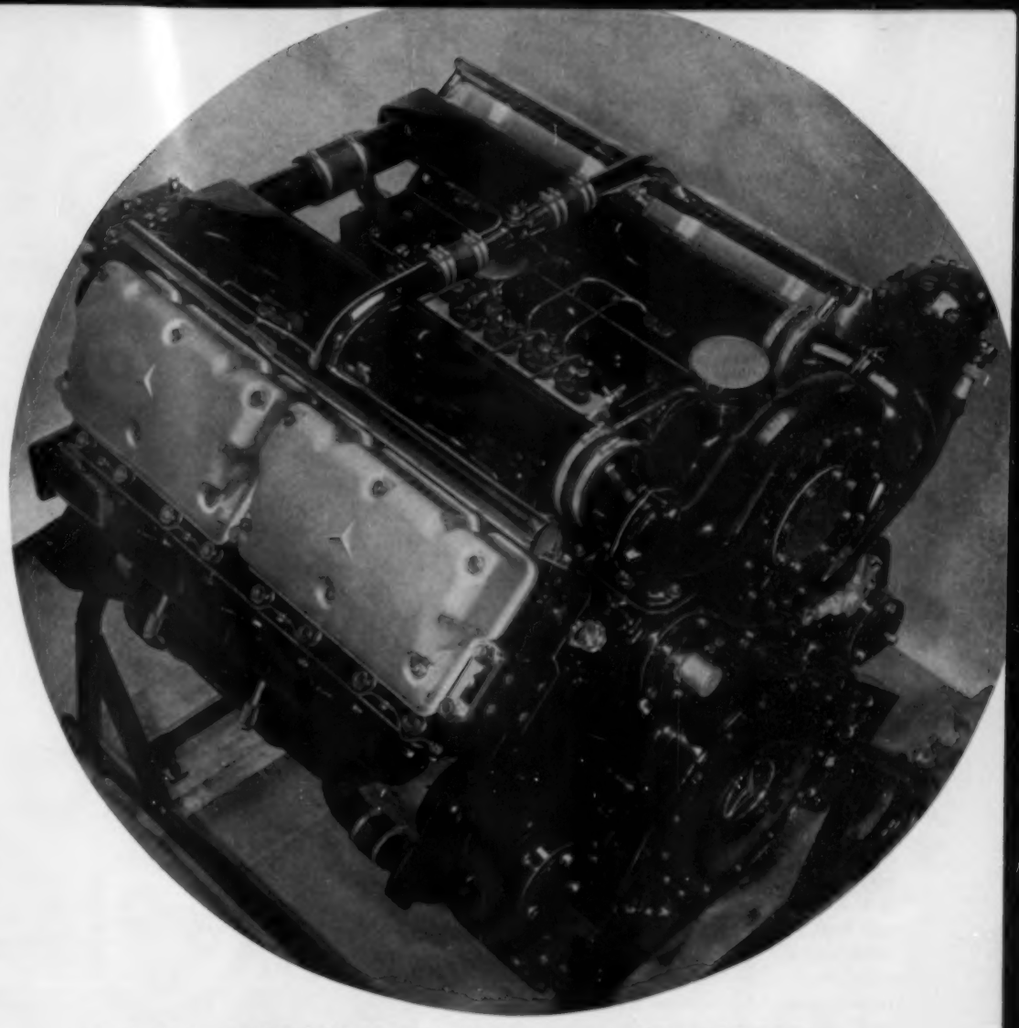
Aluminum alloy pistons are used, having three compression rings and two scraper rings, one above and one below the hollow wrist pin which is of floating type held in place by lock rings. The top ring is chrome plated. Radial holes drilled back of the scraper rings drain the oil to the interior of the piston skirt. Connecting rods are split obliquely at the bottom end and run side-by-side on the crankpin. Bottom end and main bearing shells are of precision type, steel backed and lined with lead bronze. The top half of the crank bearing is doweled in place. The bearings are grooved for oil. The crankshaft is a single forging of high tensile steel carried in five main bearings. It is counterweighted and vibration free. Journals and crankpins are case hardened, ground and polished. The rear end of the crankshaft is regularly flanged to carry flywheel and ring gear.

It should be noted at this point that every working part of the engine from main bearing to valve is pressure lubricated and distribution of the lubricant is through tubes cast in the block and rifle drilling of the various components. There is a Camshaft for each bank of cylinders and each one is separately driven by a gear in the train at the front end. There are five bearings in the block for each eight-lobe camshaft. Each pair of inlet and exhaust valves is operated by one cam and one set of mechanism. Simple tappets with flat bottoms operate the push rods with conventional ball-and-socket top and bottom for rocker arm movement. The rocker arms are short, simple in design, each one having its own fulcrum shaft. Double arms at the valve end operate inlet or exhaust valves in pairs. There is an adjusting screw for each valve. Inlet and exhaust valves are similar except that the latter are made

of a more heat resistant material. Valve seat inserts are screwed into orifices in the head.

The gear train at the front end of the engine operates in a casing cast integral with the block and fitted with removable cover. This train drives both camshafts and all accessory equipment including the fuel injection pump, lube oil and water pumps, generator, speed transmitter and supercharger. The master gear on the crankshaft drives a central intermediate gear which in turn engages the water pump gear on the left, the generator drive on the right and a larger intermediate gear above. This latter in turn is suitably meshed with the two camshaft drive gears, an intermediate gear drives the fuel pumps and topmost in the train is the supercharger drive. The lube oil pumps have their own gear drive below the crankshaft. The complete assembly is totally inclosed, fully lubricated and properly vented which is also true of other inclosures on the engine. The entire fuel injection and electrical systems are made by Robert Bosch. The eight-barrel pump serves all the cylinders. It is placed in a very accessible perpendicular position in the V-space between cylinder banks and is connected to the injectors by uniform length of tubing. The governor is an integral part of the pump and there is





In the V between cylinders the Robert Bosch fuel injection pump and its accessibility are clearly shown. Breathers for gear housing and crankcase are in evidence. Fuel filter appears at the upper right while below the cylinder bank the neatly placed lube oil cooler can be seen.

an automatic timing arrangement which advances the time of injection as engine speed increases and retards it as speed is lowered. The fuel injection pumps are too well known to require detailed description. A hand operated priming pump of the same make is attached to the engine and there is a large fuel filter also attached.

The electrical equipment includes generator, 24-volt starting motor, the glow-plug system and an electric motor to drive the pre-start lube oil pump. Upon pressing the engine starter, the oil pump starts first and the engine starter will not engage until full pressure is established on the lube oil. In connection with the pressure lubricating oil system for the entire engine there are three service pumps in addition to the pre-start pump which, incidentally could also be used temporarily as a service pump. Operating on the dry-sump system there are two stripping pumps, one for each end of the pan to carry off the oil regardless of inclined position of the engine. The oil is delivered to a reservoir on the right hand side of the engine. Oil entering is dropped through a screen. This reservoir or tank is equipped with copper coils to heat the oil before starting in extremely cold weather. The delivery pump serving the pressure system takes its oil from the reservoir and delivers it, via twin filters mounted on the back of the engine, to the central header in the block and the branches leading to all parts of the engine.

A closed fresh water cooling system is employed. Temperature is thermostatically controlled. The system is of the utmost simplicity and extremely compact. A gear driven centrifugal type circulating pump and a compact oil heat exchanger are mounted on the left hand side of the engine. An outside source of raw water is needed. It goes without saying that the manner of directing water flow within the jackets to all areas needing cooling is well designed and very effective. Access to all working parts of the engine is quite simple. With bottom closure of the crankcase removed and the cylinder heads taken off the working components are exposed and accessible. Every external accessory can be removed easily and since the engine is primarily of aluminum alloy there are few heavy parts. The smaller moving parts, particularly the valve operating mechanism can be exposed for inspection and adjustment very readily by taking off the covers.

As for installation, provision is made for four-point suspension through use of four brackets, one at each corner of the engine, carrying rectangular rubber pads for vibration isolation. The brackets are attached to the main casting of the block. In general, the engine is of very clean design and construction inside and outside. Painstaking care has been employed to eliminate difficulties sometimes associated with difference in expansion and vibrations set up by pulsations in oil lines, manifolds and cooling system. The engine is devoid of complication.

SAN JUAN FERRIES

By ED DENNIS

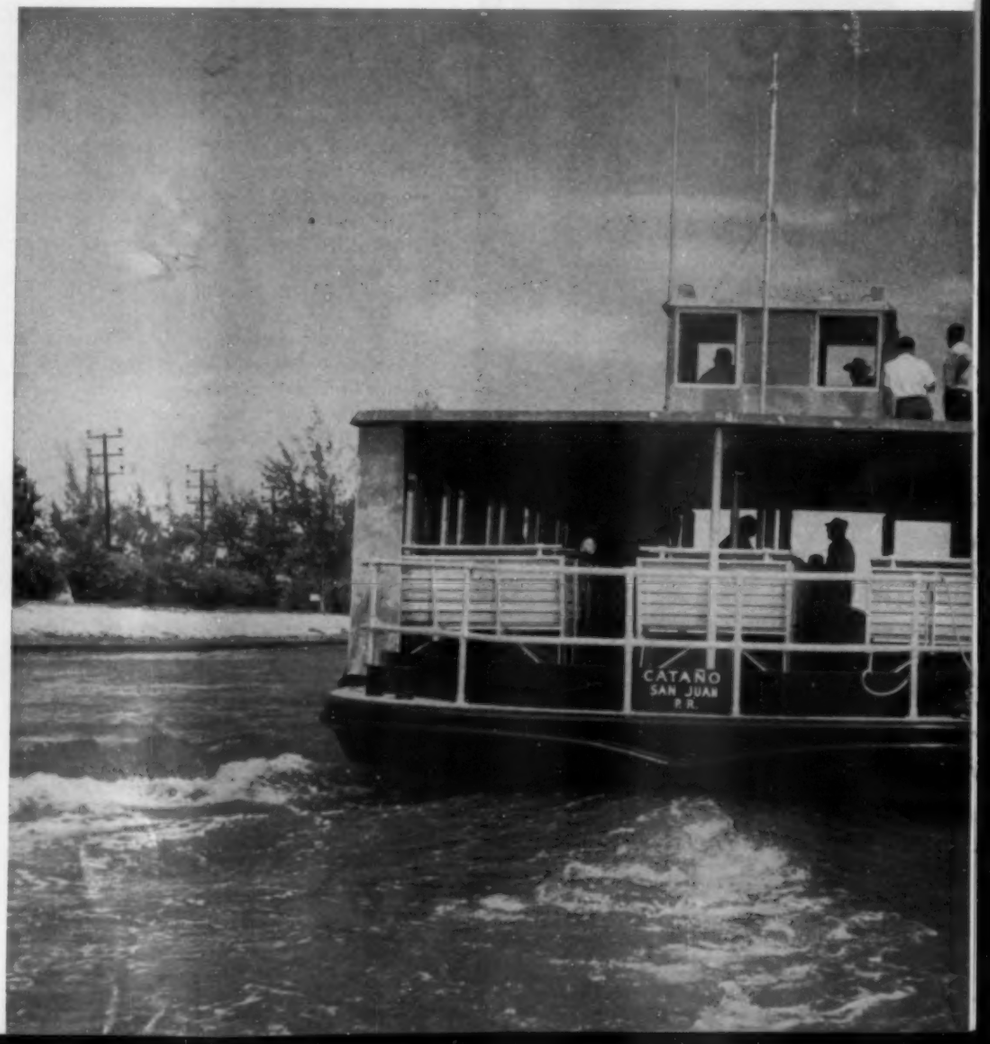
EACH of the two new dieselized steel hulled ferry boats *Catano* and *Bayamon* owned by the Compania Popular de Transporte Inc. of San Juan Puerto Rico, are equipped with a model HRMS 602.5 Cummins diesel engine to provide speedy commuting service across San Juan Bay from Catano to San Juan. These new dieselized ferries are part of the overall plan to modernize their facilities on San Juan Bay and are replacing two old wooden hulled vessels which had gasoline engines for propulsion. Both the *Cantano* and the *Bayamon* are proto-type vessels and if proven successful will provide necessary technical "know how" for the eventual construction of other dieselized ferries.

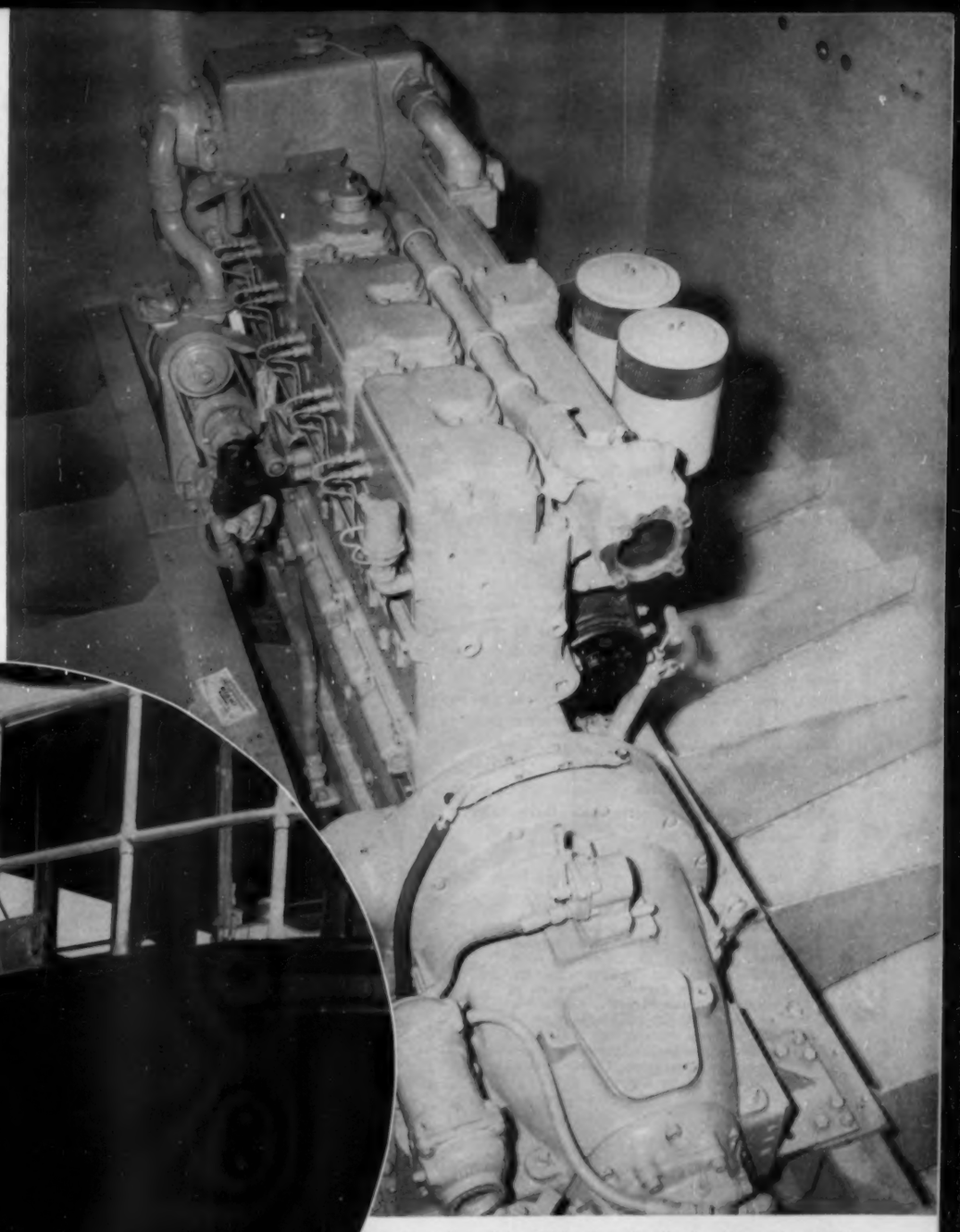
San Juan the capital of Puerto Rico, is a city rich in historical background. Settled in 1508 by the Spanish it was not until the Spanish American War in 1898, that it became an American dependency. With its population of about 250,000 people it is the hub of the Puerto Rican sugar, tobacco and fruit industries, exporting large quantities of these products to all parts of the world. By using these ferries across the harbor of San Juan, the suburbanites of Cantano save traveling around the Bay and eliminate the parking problem in San Juan. The trip across the harbor will be made in 7 minutes, shortening the present time by 30%.

Designed, engineered and built by the Miami Shipbuilding Corp. of Miami, Florida, the *Catano* and *Bayamon* are 55 feet long and have a beam of 18 feet 4 inches, a draft of 4 feet and displacement of 51.3 tons at the design load line, while the volumetric displacement is 14.0 tons. These are single ended ferries and designed to accommodate 151 foot passengers. The superstructure is constructed of 6061-T6 aluminum, using the inert gas welded metal arc welding process. Vertical safety glass sliding type windows are installed on both sides. The all welded steel hull is compartmented so that flooding of two compartments can take place without any danger to the vessel or passengers. The main hull is constructed of commercial grade S.A.E. 1020 hot rolled steel with shell plate of $\frac{5}{16}$" steel to provide additional strength and minimize any damage to the hull.

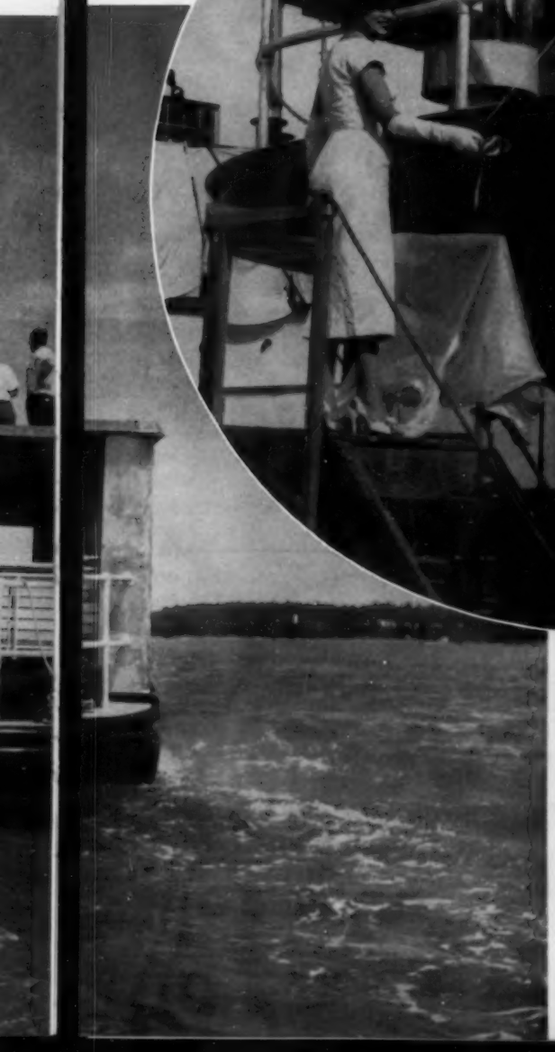
The keel is a $\frac{1}{2}$ x 6 in. flat plate installed externally with a vertical 10" junior I beam installed internally. Frames are of $\frac{3}{8}$ x 3" flat bar on 15" centers. Four inch steel pipe stanchions are used to support the main deck where necessary. A 4 inch half round steel schedule 80 pipe is installed at main deck edge. Power for the *Catano* and *Bayamon* is supplied by model HRMS-602.5 Cummins 6 cylinder diesel engines, developing 225 hp at 1800 rpm. Bore and stroke is $5\frac{1}{8}$ x 6 in. with 743 cu in. piston displacement, plus Capital 2.48:1 hydraulic reverse and reduction gears.

The dieselized ferry boat *Catano* built by Miami Shipbuilding Corp. of Miami, Fla. and owned by the Companio Popular de Transporte Inc. of San Juan, Puerto Rico, on its trial runs through Government Cut, Miami, Florida.





Two views of the 225 hp Cummins diesel engine equipped with the Capital hydraulic 2.48:1 r&r gears. Engine equipment includes two Air-Maze air breathers, a Schwitzer supercharger and a 1,000 watt Leece-Neville dc generator. The two engines were supplied by the Cummins Diesel Engines, Inc., of Florida.



Miss Sandra Louisa Herata officially launched the *Catano* with a bottle of Puerto Rican rum at the yards of the Miami Shipbuilding Corp., Miami, Florida.

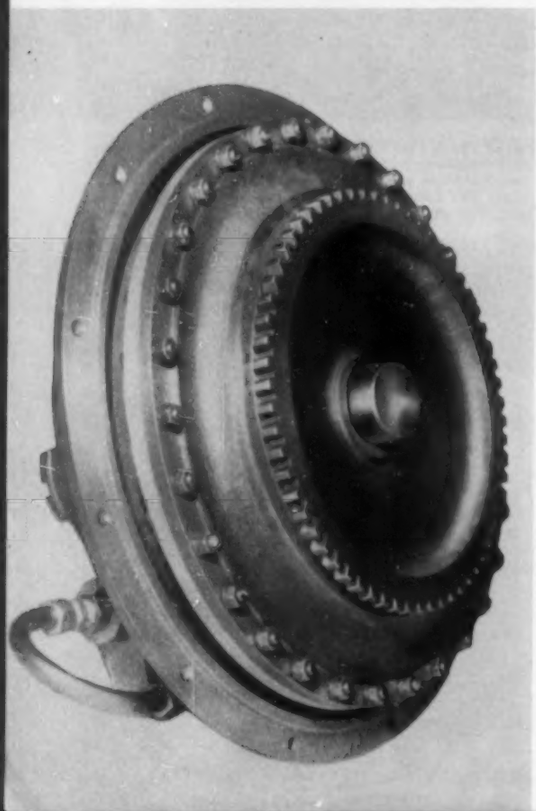
TAILOR-MADE TORQUE CONVERTERS

A Borg-Warner Power Transfer Engineer Tells of New Ways to Match the Engine and the Converter for an Improved Balance and More Efficient Working Combination.

By DAVID T. SICKLESTEEL*

WHEN hooking up a torque converter in a diesel drive line, a designer should know the converter field thoroughly. A torque converter is not a magic wand. It will deliver to the driven shaft only what the designer puts into it. He can select any of a dozen types that will do the job. But there is only one—the right one—that will do it best. What *is* that right one? Well, for years we have conducted field tests on all sorts of diesels, dual-fuel and straight gasoline engines to find a formula for selecting it. We have found that *no one* type of torque converter will match any wide range of diesel engines. A given converter, in any of its standard production sizes, is right for only a few production-type diesel engines, *and even then* it is limited to a few industrial applications where the converter's characteristics exactly balance the work requirement.

David T. Sicklesteel, Manager, Industrial Products Division, Long Manufacturing Division, Borg-Warner Corporation, Detroit, Michigan.



Assembled view of 13-inch torque converter for an industrial diesel application. Adaptable to bulldozers, front end loaders, log hauling rigs, etc. The converter permits application of maximum torque from a smaller engine without risk of stalling engine and prevents endangering drive lines by improper gear selection by an inexperienced operator. Driver fatigue is lessened by less gear shifting.

Now, this puts the designer in a quandary. Ordinarily he must use a certain engine, either because it fits the frame or the mount, or because it delivers the right output, or for some other good reason. Perhaps, as DIESEL PROGRESS illustrates every month, the reason is room. If his power requirement rises, the designer may beef up the engine and get a much higher torque output. But he can't install a bigger torque converter because there isn't room. Space requirements confine him to the same area and the same configuration.

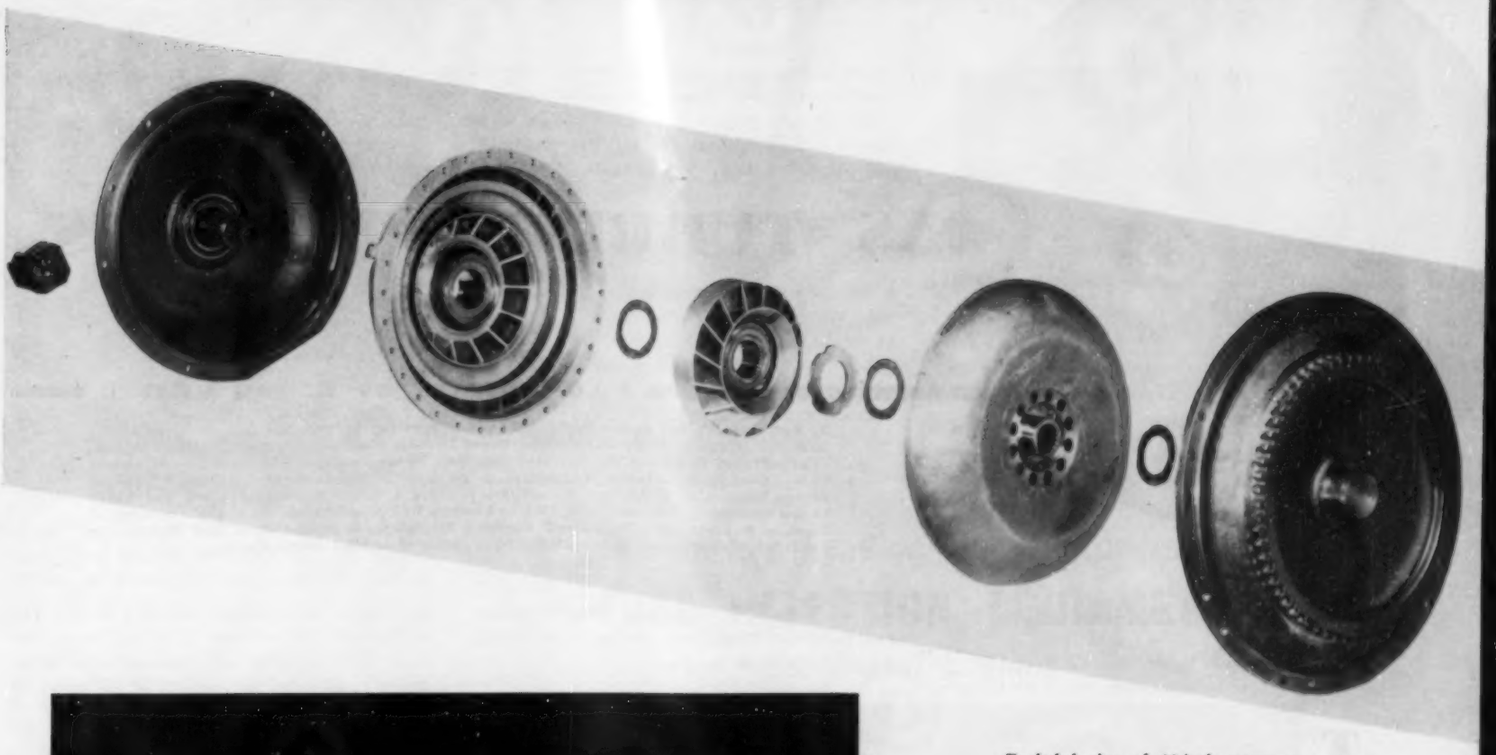
Here at the Long Manufacturing Division of Borg-Warner we started at the opposite end of the problem. Instead of trying to design and build a hundred different torque converters, we concentrated on several standard sizes and then changed the interior components so that many combinations were possible without any exterior change at all. For example, in eight standard exterior dimension converters, we can cover the entire operating range of most industrial diesels, from 40 pounds feet input through 2,000 pounds feet input. The designer can select as many as six different stall torque ratios, in graduated increments between 2:1 and 3.5:1. We tell him: "Select your engine and determine the stall torque ratio you need so that it will pick up the load. Then just go down this table and find the converter that fits your requirements."

We make it easier for the fleet owner who has a diesel-equipped fleet of trucks, bulldozers, earthmovers or similar specialized vehicles. He comes to us with a problem. He says: "I need more *push*. Those engines are all right, but they don't have much power at slow speed, and we can't dash headlong into a gravel bank at high speed. I need a new kind of converter which will develop a high starting torque while the engine is at comparatively low shaft speed." Using the same engine and the same exterior size converter, we can select interior components which will boost his torque multiplication and get those heavy loads started smoothly. Further, these "tailor made" converters smooth out the jerky, pulsating power impulses of diesel engines operating at low rpm's and allow the use of more compact gearboxes; there isn't so much banging and vibration.

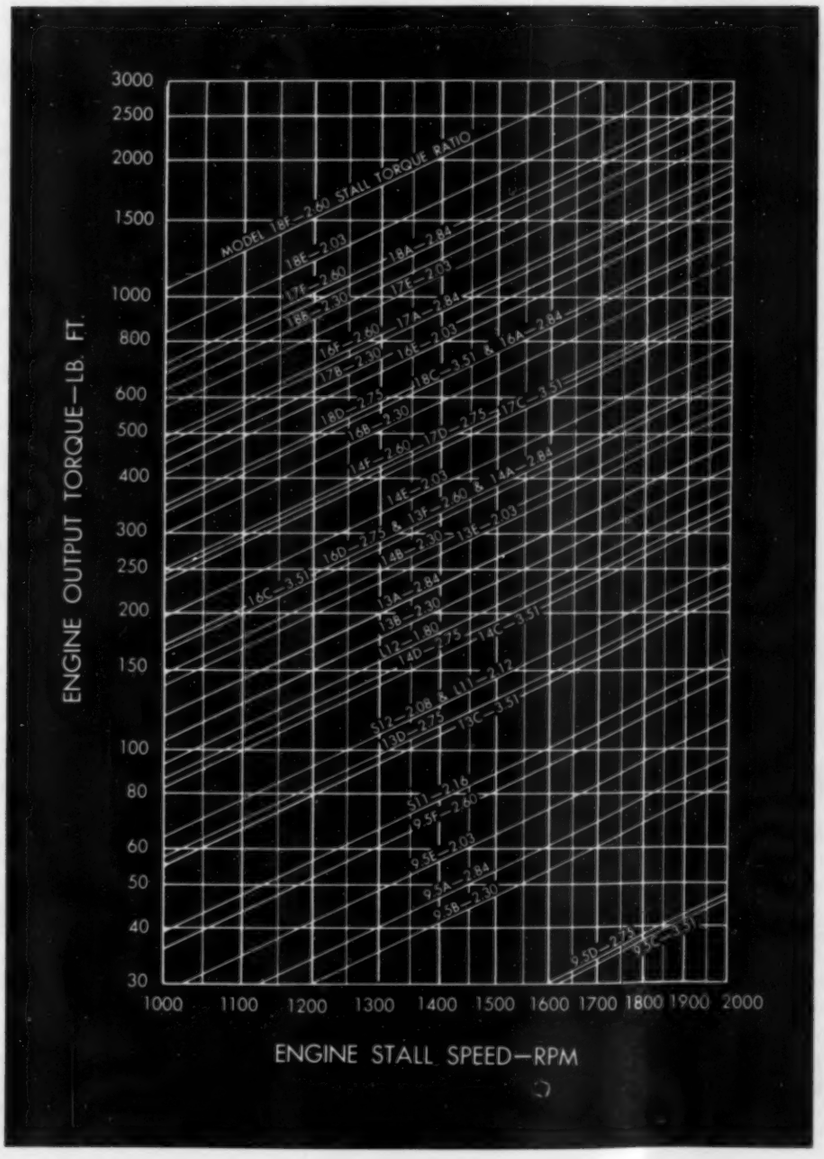
As engine speed increases gradually to move the load, these converters smoothly decrease torque multiplication in a descending, nearly straight line. At highway speeds they will go into the high-efficiency coupling range. We've heard it said that Borg-Warner has made more transmissions than any other manufacturer. Maybe so. B-W conducted research and development for many years to come up with something that is definitely unique. This "tailor-made" feature permits a smaller engine, for example, to deliver the required "oomph" for a heavy starting load. It greatly simplifies operating maintenance. With a torque converter there is no problem of vibration and "chatter" in the power line if the operator makes the wrong gear selection. But the converter must be well matched to the engine and the work-load characteristics in order to get the most work done per day.

Remember that the engine must develop its torque first, before it can transmit it to the converter. The converter's job is to increase and transfer this torque along to the shafts, smoothed out, vibration free, and boosted to whatever degree of multiplication necessary. For that job, we at B-W do not believe that a heavy and cumbersome piece of equipment is necessary or desirable. A torque converter ought to be as simple as possible, light weight,

*Manager, Industrial Products Division, Long Manufacturing Division, Borg-Warner Corporation, Detroit, Michigan.



Exploded view of 13-inch converter with housing and charging pump to be used in an industrial application.



leak proof and trouble free. Using Nature's own laws, identified and codified through years of research, we can change the internal components to achieve the desired results—the pitch of impeller and stator blades, sturdiness of the walls, size and shape of each piece of metal that comes in contact with the circulating fluid. Working on this principle also saves expensive design time, either to redesign the whole engine mount and transmission or to make endless changes for accommodating converter and gearbox of another size. It saves material, reduces production costs in the manufacturer's shop and customers' field inventory.

This year a well-known tractor manufacturer is offering a line of 1957 models with increased engine power and converters tailored to this increase, with *no other* transmission changes. The customer gets a substantial power boost as a bonus. For a long time it has been a source of some concern to us that diesel users, in general, overlook tailor-made converters when planning a new diesel installation. Wherever there's a heavy load to pick up and move; wherever there's a built-in problem of "chatter," knocking, vibration, overloaded transmissions and general abuse with the whole rig, tailored torque converters calm things down. They save operating and maintenance costs, too. Any unskilled operator can handle these installations, because the drive line will not be abused. And the designer doesn't have to be a trained transmission engineer. He can find the right converter for his problem by using the accompanying table. Any diesel owner can do it; operating engineers, too. Try it!

GAS TURBINE PROGRESS

A COMMENTARY BY R. TOM SAWYER

R. Tom Sawyer's well known in the gas turbine field having been the first chairman (1944) (and now treasurer) of the Gas Turbine Power Division of ASME. He spent 7 years with G.E. Transportation Dept., and 26 years with American Locomotive, now Alco Products. At present he is a Consultant, including "Consultant to the Staff" of the Experimental Towing Tank at Stevens Institute of Technology. In addition to being a Fellow Member of ASME and AIEE, he is a member of SAE, ARS, ANS, IME in London, DEUA in London. He is also a member of Franklin Institute and a Professional Engineer. Mr. Sawyer is the author of *The Modern Gas Turbine* and *Gas Turbine Construction*, and co-author of *Applied Atomic Power*.

Gas Turbine in Chemical Industry*

by Z. Stanley Stys, V.P.
Brown Boveri Corporation, New York City

THE gas turbine used in the chemical industry shows us another natural application of the gas turbine with a material reduction in operating cost, a reduction from 350 kw hr down to 240 kw hr per ton of nitric acid, and in special cases as low as 126 kw hr per ton. The ammonia oxidation process will be described here or the manufacture of nitric acid. The best known process (in this country in any case) is the ammonia oxidation process based on the well-established DuPont process for oxidizing ammonia at a medium pressure range, which was developed some 30 years ago.

The schematic arrangement of such process used by the Chemical and Industrial Corporation is as follows. The air enters a centrifugal type compressor in which it is compressed to 120 psig. The compressed air is then led to a preheater where its temperature is brought up to about 550 F, after which the air meets the vaporized ammonia in a gas mixer and combines with it over a platinum gauze catalyst. The products, namely the nitric oxide and nitrogen are separated in the different columns and towers. Not going into the chemical details of the process, the net result of interest to us is that the hot nitrogen in a temperature of about 900 F is available for expansion in a gas turbine.

Since such supercharging methods for chemical or combustion processes were known to Brown Boveri for more than 30 years there was no particular difficulty, also in this case, to provide suitable machines for this purpose. Experience gained from the Velox boilers and Houdry process application was immediately available and the first unit of this type was put into operation in Europe some 20 years ago. This particular set-up, however, was introduced to this country only in 1953 in the plant of the Mississippi Chemical Corporation at Yazoo City, Mississippi. The Chemical and Industrial Corporation of Cincinnati, Ohio, designed and built the plant.

Such a pressure of 120 psig cannot be achieved efficiently in a single-casing uncooled centrifugal blower. There are different ways of securing far better compressor efficiency, i.e. lowering the power input from outside sources, namely by dividing the compression into a few stages with single interstage cooling or as Brown Boveri does it through interstage cooling in many stages with coolers built into the compressor itself. This arrangement reduces the input even further and the compression line approaches ideal isothermal compression. We call this machine, therefore, an Isotherm compressor. Not all of the nine compression stages are cooled. The temperature rise in the first stage does not warrant cooling. The last stage does not justify any cooling since the air has to be heated after the compressor. Therefore, the machine has only seven cooling stages.

The regulating system of the compressor serves to keep the discharge pressure at a constant value. In most of the nitric acid plants such sets are equipped with a synchronous motor so that speed variation is, of course, not possible. The pressure can, however, be adjusted by throttling the suction air. This type of compressor was originally developed for supplying air to deep mines, for ventilation, and as the central air supply needed in large manufacturing plants.

The hot nitrogen of about 900 F and about 75 psig enters the reaction type gas turbine where it is expanded to atmospheric pressure. The expander directs the cooling air to the balancing piston and the glands. This blocking air is meant not only to cool the glands but also to block the gases from entering the machine room as they contain some NO and NO_2. On some smaller sizes of turbines Brown Boveri is using a two-stage impulse type expander whereas the larger sizes have exclusively eight and nine stage reaction type expanders installed.

The design of the Brown Boveri welded rotor was also used in this case. This design is particularly suitable for quick starting of the unit and is characterized by its sturdiness and light weight. The turbine expander recovers ⅔ of the total power input necessary while the synchronous motor referred to furnishes the other ⅓ of the power required for the compression of the air.

The gas turbine has no control system of its own. Since this is of the reaction type, the pressure is directly proportional to the gas quantity. Also in this respect it corresponds to the general operation of the nitric acid plants as the pressure in the process is held constant. The expander is equipped with the standard safety devices, such as overspeed tripping, and over-temperature protection, which actuate the shut-off valve at the inlet of the expander.

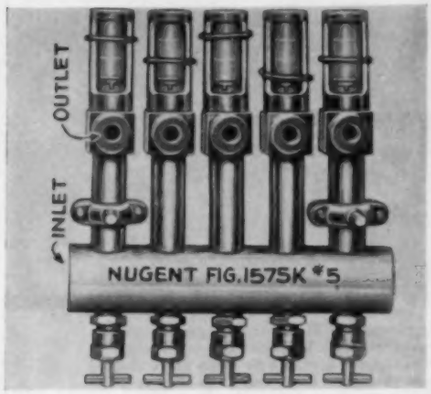
During the starting period of the chemical process there are no hot tail gases available for the gas turbine. In certain instances the motor is not sufficiently large to drive the compressor at full load and, therefore, some air is by-passed to a combustion chamber which helps to bring up the set to its full capacity. The combustion chamber is of very simple design, containing an outer casing with heat insulation and the inner lining containing the hot gases. The design of the burners depends on the kind of fuel burned. The ignition of the fuel in the combustion chambers occurs by means of an electrical rod.

In case of a steam turbine drive, which is located on the left side of the compressor, no gear is necessary as such turbine can easily be adapted to the speed of the compressor shaft. However, while applying a motor being 4 or 6 pole design, one is bound to 1800 or 1200 rpm whereas compressor and expander shaft usually turn much faster. The use of a gear is, therefore, absolutely necessary to connect these machines. The type of gear used in this particular application is a single helical design. The gear is calculated at the maximum load of the motor in order to be sure an ample margin of power is left even at the most unfavorable operating points for the gas turbine.

The application and the satisfactory operation of the gas turbine cycle especially in combination with Isotherm compressor opens a new field for this prime mover in the chemical processes.

**This is an abstract of a paper presented before the March 18-21 meeting of ASME, Gas Turbine Power Division, Detroit.*

Pressure Sight Flow Lubricator



A new pressure sight flow lubricator has been announced by Wm. W. Nugent & Co., Inc., Skokie, Illinois. This unit will deliver lubricating oil or other liquids under pressure, in accurately measured quantities, to high or otherwise inaccessible points. They are available as single units or in multiples to 15 depending upon the number of feeds required. Each lubricator making up a multiple unit is capable of feeding fluid in amounts varying from several drops to two pints per minute by simple adjustment of the individual needle valves.

Single lubricators are available with ¼ in. or ⅜ in. ips inlet and outlet. Inlet sizes of multiple units range to ¾ in. ips with ¼ in. or ⅜ in. ips outlets.

All are designed for 125 psi maximum working pressure. Complete details are available by writing Wm. W. Nugent & Co., Inc., 3440 Cleveland Street, Skokie, Illinois. (ITS NEW)

New Submarine

One of the Navy's newest submarines, *USS Darter,* stretches her sea legs as she commences sea trials in Long Island Sound. *Darter,* shown making a high speed run, was built at General Dynamics Corporation's Electric Boat shipyard in Groton, Conn. Her sound-proof engine compartment makes the *Darter* one of the Navy's quietest submarines. She is powered with three Fairbanks-Morse 1335 hp diesels.

Sales Staff Appointments

Appointment of Robert M. Thomas to a newly-created post of staff sales consultant has been announced by Perfect Circle Corporation. Thomas was formerly sales manager, manufacturers' division, for the corporation. In his new position, Thomas will investigate sales potentials and plan sales programs for new products under study by Perfect Circle.

Thomas joined Perfect Circle in 1932 when he became the first vice president and general manager of Perfect Circle Company, Ltd., Canadian subsidiary of Perfect Circle. He remained at that post for 11 years and then transferred to the parent company as sales manager of the manufacturers' division. He has served in that capacity for 13 years.

Moving into the position vacated by Thomas will be Rufus P. Austin, now assistant sales manager, manufacturers' division. Austin was first employed by PC in 1926 as a clerk in the production office.

In a series of promotions, Austin became assistant manager of the Hagerstown plant and later production control manager for the corporation. He has served 12 years in his most recent position and for the past eight years has been in charge of PC's Detroit and Chicago offices.

Rufus P. Austin

Robert M. Thomas

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WHAT'S GOING ON IN ENGLAND

CONDUCTED BY **BERNARD W. LANSDOWNE**

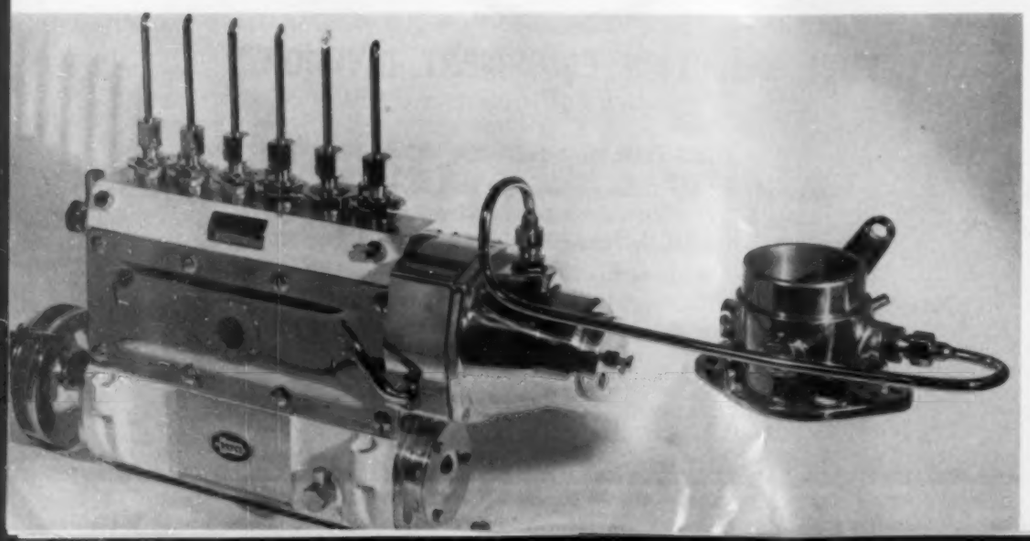
Bernard W. Lansdowne is an associate member of the Institution of Mechanical Engineers and is widely known among British and European diesel manufacturers as editor of our English contemporary "Gas & Oil Power." His early workshop training was spread over seven years with A.E.C., Ltd., Southall, following which he served some five years with that company's sales engineering department. He entered technical journalism as assistant editor of "Gas & Oil Power" in 1950 and was appointed editor in 1952.

Pump with Pneumatic Governor

A particularly interesting fuel injection equipment development, in view of the British trend towards the use of small lightweight high-speed engines for road transport applications, is the recent introduction by Bryce Berger Ltd., of Staines, of a multi-cylinder camshaft-type injection pump incorporating a pneumatic governor. Low weight and compactness are the main features of the new design which is known as the Bryce A-type pump. It caters for the increasingly severe operating conditions arising from the move toward higher speeds, by making use of roller bearings of comparatively large size. This enables a very stiff camshaft to be used, better able to resist dynamic deflections, and, together with the high load-carrying capacity of the bearings, gives increased life.

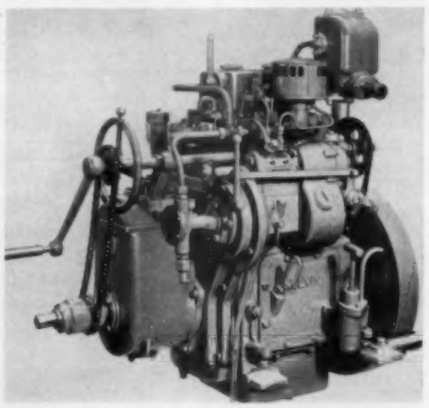
The governor unit is capable of controlling the engine speed at any value between the maximum and idling speeds, which are predetermined by adjustable stops, and it is therefore suitable for commercial vehicle applications and also for industrial and marine engine use. The two main portions of the governor are the venturi air flow control unit mounted in the induction pipe between the air filter and the engine, and the pressure sensing unit which is mounted on the fuel pump and operates the fuel control rack. These two parts are connected by an air-tight tube. The operation of the governor is based upon the well-known principle that air velocity across the end of a tube will tend to cause a pressure drop in that tube. In this case, the air velocity to the engine across the top of the tube is controlled by a butterfly valve in the venturi unit, and the pressure drop set up in the tube is transmitted to the governor casing. The volumetric efficiency of the engine is not changed by the presence of the venturi unit.

The governor casing is divided into two halves by a leather diaphragm, specially treated and prepared to render it extremely pliable. One half forms an air-tight chamber with the exception of the tube connection to the venturi, but the other half is open to atmospheric pressure. A light spring acts on the diaphragm, loading the fuel control rack towards full fuel, and the balance position of the diaphragm under the action of the spring load and depression on one side and the atmospheric pressure on the other, positions the fuel pump rack so as to deliver the required amount of fuel to the engine. In its operation the spring also damps out high frequency pressure variations thus contributing to a smooth response. In order to stop the engine a lever is provided which can over-ride the spring and move the fuel control rack to the stop position. A small auxiliary spring is also housed in the governor casing to provide the necessary engine idling performance. The engine speed is controlled within its limits by the lever operating the butterfly valve, which may be actuated by an accelerator pedal or other appropriate mechanism.



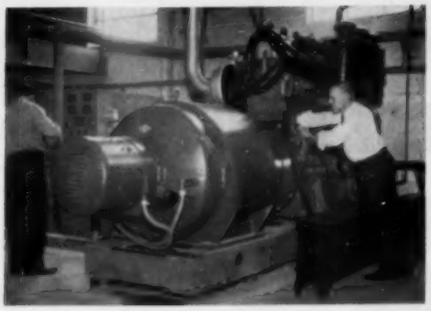
New Kelvin Twin

The Scottish firm of Bergius Co., who are members of the Associated British Engineering Group, have been building marine engines for more than 50 years, their range including petrol, paraffin and diesel designs. Bergius market their engines under the trade name of Kelvin and they have just recently extended their field with the introduction of a new two-cylinder marine unit of smaller power than was hitherto available from them. The



new engine is known as the P2 and has cylinder dimensions of 3¼ in. bore by 4 in. stroke. It provides 10 bhp at 1,500 rpm, operating on a four-stroke cycle with direct injection. The fuel consumption is given as 0.42 lbs per bhp per hr. As usual on these smaller sizes of marine engine, hand starting is provided but electric starting and a dynamo can be fitted if required. The engine is arranged for direct sea water cooling, the design including a water-cooled silencer and exhaust pipe. As an alternative, however, fresh water cooling by means of a heat exchanger carried on the engine can be provided and with either version the water pump is a rotary self-priming unit, flange mounted on the engine and gear-driven from it. To increase the structural strength the crankcase and cylinder block are formed as one unit. This allows large size doors to be provided on each side to give easy access to the working parts. All of the external structure of the engine is of cast iron to give protection from sea water corrosion. The cylinder liners are of the wet type with synthetic rubber sealing rings at the lower end.

Standby Power for Hospital



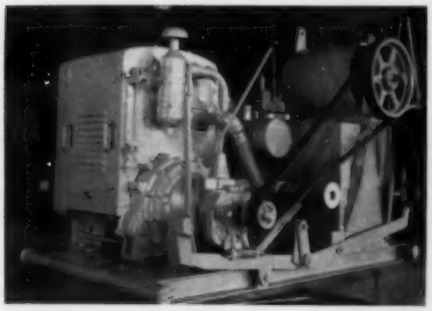
Recently completed is a 350 kw engine generator set installed in the boiler room of the new addition to the Edward W. Sparrow Hospital. This unit will automatically take over and supply emergency electrical power to the hospital in the event of a power failure. O. J. Munson Associates engaged The Warner & Swasey Company, Duplex Division to build and install this unit. George L. Hagren, Chief Engineer, is in charge of the operation for Duplex. It is the largest engine generator set the company has manufactured to date. A Waukesha Turbocharged diesel drives an Electric Machinery generator.

Amot Sales Manager

P. E. Letchworth

The appointment of Mr. P. E. Letchworth as Sales Manager of Amot Controls Corporation has been announced by Mr. E. B. Fox, President. Mr. Letchworth is an engineering graduate of the University of California. He was formerly employed in engineering work at Anaconda Copper Co., Sullivan Machinery Co., American Locomotive Co., and Atlas Imperial Diesel Engine Co. At Atlas Imperial Diesel Engine Co. Mr. Letchworth was engaged in sales work, where he gained valuable engineering sales experience and know how.

Dieselized Wire-Line Reel



On off-shore oil well installations, a power driven wire-line reel is necessary when determining well depth, and for running such accessories as are used in testing as the well bore goes deeper. The unit is also of service when working over a well after completion. The usual gasoline-engine driven unit is not only somewhat light for this exacting service, but also requires additional safeguards on account of the spark hazard around wells producing gas. To provide a better unit for this work J. N. Danhaiser, the petroleum engineer for Pure Oil Company and engineers of Buda Engine & Equipment Company, of Houston (now succeeded by Applied Power Equipment & Manufacturing Company) developed a unit with much more power than the original reel, and utilized a Buda BD77 diesel to drive the reel.

Engine and reel are mounted on a single skid base, with final drive to reel a 3-strand V-belt with tightener-idler pulley adjustable from either engine or reel end of the skid. A standard Ford transmission was mounted on the diesel, which provided a disconnect clutch as well as four forward speeds. Working transmission and idler pulley in concert, any line speed from zero to high can be secured, and accurate control of the unit on the end of the line assured. The hand brake of the reel is backed up by the transmission and, through it, the compression braking of the engine is available to check the rate of descent into the well, not only saving brake drum and braking material, but also providing more uniform application of tension to the wire line. The sheet steel pedestal upon which the wire-line frame is carried is, of course, hollow and, being provided with a hinged door, provides storage space for tools and accessories. The unit also carries its own fuel and lube oil supply and, being equipped with a spark-arresting muffler, (this latter fitted in such a manner as to direct the exhaust away from the operating position) meets all requirements against fire hazard.

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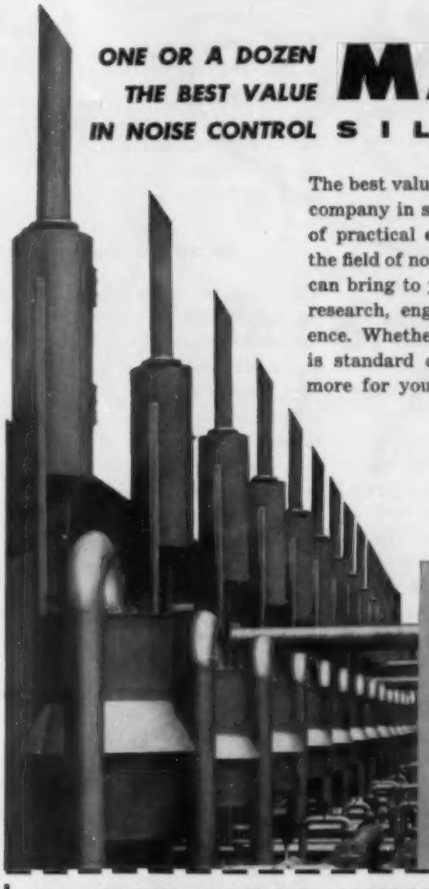

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EASTERN DIESEL OBSERVATIONS

A COMMENTARY BY ARNOLD B. NEWELL

Arnold B. Newell, a third generation American, was born near Seattle, Washington of pioneer stock. He obtained his engineer's license at 21. Sailed as chief engineer on one of the first ocean-going motorships built in the U.S.A. In 1924 he joined New York Shipbuilding Company in diesel advisory capacity, tested and took to sea New York-Werkspoor diesels, supervised operation of shipyard owned vessels, then in 1927 joined Ingersoll-Rand as diesel field engineer. Became associated with "Motorship" in 1929. Subsequently became managing editor of "Motorship" and "Diesel Power," then vice-president and general manager.

Fuel Additives

With constant increase in use of the various kinds of economy fuels in diesel engines we hear more and more about additives, many and varied and regarding which not too much is known by the man using them. The manufacturer's name on the container and a number or a trademark serves to identify a product for the plant engineer who can prove its worth by a trial. In one diesel plant the engineer will be regularly feeding one brand of additive to the fuel and swearing by it as the cure for all evils found in combustion and lubrication. Another plant engineer will state that he tried it and found it of no value, but he has a brand that keeps his engine clean and purring like a kitten. These are undoubtedly honest opinions that apply to dissimilar conditions of operation and various kinds of fuels burned in several different types of engines. In talking with plant engineers we find additives being used for different reasons that are however related. One man says the additive keeps injectors clean, another finds the pistons are freer of carbon and varnish, still another cures a problem of stuck rings and some one else finds carbon in exhaust ports while still another says the combustion chamber remains cleaner because he uses an additive.

The various economy fuels may be referred to as No. 6 fuel, Bunker C, residuals, blends and in some plants the crankcase drainage from garages is sold bulk as diesel fuel. To prepare these fuels for use in diesels they are strained, heated, centrifuged, filtered and maintained at a temperature high enough to keep the viscosity down to usable form in fuel injection pumps and injectors. However, there is one general characteristic of economy fuels that remains unchanged by the processing just mentioned and that is lack of stability. The mechanical action of the centrifuge breaks up agglomerates temporarily, but shortly after processing clusters start reforming and for that reason the interval of time between centrifuging and injection must be limited. The heavy fuels can not be batch processed and held in storage for future use. This is a situation sometimes difficult or costly to control. For example a centrifuge may need repairs and for reasons of security a standby machine would be needed, increasing plant investment.

The producers of additives are endeavoring to stabilize the processed fuel, thus prolonging the time interval between processing and actual use in the diesel. Success in this effort permits the use of cheaper fuels in locomotives and other classes of service where the equipment for fuel processing can not be carried along with the engine. As more experience is gained through using additives we can expect to find more and more diesels burning the cheaper fuels, which, by the way equal or exceed in heat values regular No. 2 diesel fuel.

Small Marine Gear Sets

The degree of success achieved in this country in the manufacture of marine transmissions for use in relatively small diesels was revealed last winter at the National Motor Boat Show in New York City. Most of us who had attended this intensely interesting annual event have displayed proper interest in the various makes and models of reverse and reduction gears attached to the diesel and gasoline engines and let it go at that. We believe they are all good gears and that none better are needed. In short we have lived with them so long that we take them for granted.

At this past show we saw some excellent gear sets made on the other side of the Atlantic. Good? If price is any measure of quality they must have been out of this world. One of these gear sets was attached to an intensely interesting engine type which I wanted to describe. The agent said, "I am afraid we will not have much to say about this engine until we can have it fitted with an American gear." I surmised that the gear might not be quite up to our standards of quality, but I was assured that just the opposite was true. "In fact, the thing costs more than the engine, and we can't let the geartail wag our engine dog, not price wise at least," was the informative rejoinder.

In other instances diesels of foreign origin are offered with gears of American make in order to hold down the price of the complete package and not, as we might have thought, to take advantage of nation wide service facilities. They pay high tribute to the specialists in marine transmission design and manufacture in this country, not by stating that better design and workmanship can be found in the American product, but by granting that what is available here is entirely adequate at considerably less cost.

Diesel Outboard Propulsion

Since many commercial vessel features originated in pleasure craft, the current trend to the use of outboard motors may be looked upon as practice likely to be more extensively emulated in large commercial craft because the advantages are similar in many respects. For one thing the space commonly devoted to inboard power can be utilized for quarters or cargo as the case may be. The hull design and construction can be simplified thus reducing costs. The rudder and the structure to carry it are also eliminated making an added saving. In these respects the analogy is similar. Beyond them there are differences. The outboard gasoline motor has inherent disadvantages that are not found in the heavy duty diesel outboard drive. For example the spark ignition outboard is of 2-cycle crankcase scavenging design which means that the lubricant must be admitted with the fuel and the mixture is more expensive than fuel alone. The lubricant is continuously carried off with the exhaust gases. Also in the 2-cycle gasoline motor throttling of the fuel-air-oil mixture to run at reduced speed reduces crankcase pressure by means of which the engine is scavenged. Variation in scavenging pressure varies scavenging efficiency and therefore combustion and thermal efficiencies change with power output.

The diesel driven outboard system for commercial vessels on the other hand retains the inherent economy and efficiency of the engine used. If it happens to be a 2-cycle engine, full volume of scavenging air is admitted at all speeds and power outputs. The lubricant is not mixed with the fuel and burned up and thermal efficiency remains high at all speeds and loads. Since there is such a vast difference in overall efficiency favoring the system used in the big commercial installations, particularly the Harbormaster, it may be that this difference would be more readily recognized and accepted if some way could be devised to disassociate them from the 2-cycle gasoline burning counterpart. The fact that one kind of outboard finds its most popular use in boats doing relatively little running and not much hard work and the other kind performs best under steady arduous operation is not reflected in the single word describing both kinds of machinery. At the same time the word "outboard" has proved to be more descriptive of what it is than were earlier designations.

West Coast News

By James Joseph

TO DICK Illge, Portland, Ore., a Fairbanks-Morse Model 45B3-⅛, 5¼ hp diesel engine.

ANNETTE Island, Alaska's Henry Benson has repowered his purse seiner *Joycelyn* with a GM 6-110 diesel, replacing an old diesel engine.

TWO GM 4-71s will power E. Anderson's new 60-ft cruiser, *Bridges II*, slated for delivery in April. Boat will harbor at Tacoma.

PACIFIC Fishing and Trading Co., Seattle, reports sale of an Allis-Chalmers 6-DAMR-844, 156 hp @ 1600 rpm, with 3:88-1 Capitol hydraulic gear, to Trygve Pedersen, for his boat, *Summit*.

FOR repowering the vessel, *Victory Maid*, an Allis-Chalmers 8-DAMR-1125, 195 hp @ 1600 rpm, 4:5-1 Capitol-geared (hydraulic) diesel. Boat's owned by Seattle's Oscar Holsbo and Ora Olson.

TO COLBERT Boat Works, Stockton, Calif., a Fairbanks-Morse 45B3-⅛ diesel generator set, 5¼ hp.

WORKING a contract for the State of Washington are two new 88-B Bucyrus-Erics powered by 8DAS-1290 Allis-Chalmers (Buda diesels), each with model 18-CK Torcon convertors . . . the contractor, Cougar, Wash's Jones-Tompkins.

TO SEATTLE's Harris Electric Co., a Fairbanks-Morse model 45B4-¼ power unit, 10½ hp.

THE U.S. Government has just purchased five GM model 6043C 6-71 GM diesel generators for use in Alaska . . . sale by Evans Engine & Equipment Co., Inc., Seattle.

SPOELSTRA Bros. Logging Co., Forks, Wash., has taken delivery of a GM model 6130T for installation in an HD-19 Allis-Chalmers crawler tractor . . . this, the new turbocharged GM 6-71 engine, and among first installations of its type on the west coast.

FOR repowering a rotary snow plow, the Washington State Highway Dept. has purchased a GM model 6031C, 6-71 diesel engine.

TO SEA Boat Co., Costa Mesa, Calif., a Fairbanks-Morse model 45B3-⅛, 5¼ hp basic diesel engine.

FOR THE new Alaska-limit purse seiner being built by Seattle's George Peterson, a GM 6-110 diesel engine.

TWO 7-cylinder model 38F5¼, 525 hp diesel engine driven generator sets have gone to Todd Shipyards Corp., San Pedro, Calif. Engines are Fairbanks-Morse.

EVERETT, Wash's American Tug Boat Co. is powering their new 51-ft boom tug *Skip* with a GM 6-110, model 6220SRA diesel.

REPOWERING the motor vessel *Ann B* (owned by Seattle's Peter Hyde and Birger Edwards) is an Allis-Chalmers 8-DATMR-1125, turbocharged engine with 3:88-1 Capitol hydraulic gear.

RECENTLY installed in Nils Farstad's schooner, *Brisk*, an Allis-Chalmers 8-DAMR-1125 diesel, 190 hp @ 1600 rpm, with 3:88-1 Capitol hyraulic gear.

REPLACING a gas engine in the salmon troller *Tyee*, a GM 3-71 diesel. Boat's owned by Seattle's James R. Gordon.

DELIVERED to Lockhaven Marina for auxiliary power in a Garden-designed 65-ft sailing yacht, an Allis-Chalmers 6-DAMR-273 diesel, with 2:0-1 Capitol hydraulic gear. Sale by Pacific Fishing & Trading Co., Seattle.

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Northeast Diesel Notes

By Arnold B. Newell

A TUG 36 ft long, 12 ft beam and 7 ft deep is being built for the Colonial Sand and Stone Company of New York City by the Gladding-Hearn Shipbuilding Co. of Somerset, Mass. The propulsion engine will be a 250 hp Cummins L 600 diesel equipped with a 2.5:1 Capitol hydraulic reduction gear to drive a 50 in. 3-blade propeller.

A RECENT sale of a Model 1055 P & H Shovel powered by a Caterpillar diesel was made to Savin Construction Corp., general contractors of Hartford, Conn., by Casey-Gesner Equipment Corp. of Hamden, Conn.

THE SUBJECT of oceanographic research vessels seems to have crystalized on a hull 170 ft length, 33 ft beam, 14 ft 9 in. draft, 1000 tons displacement and 1000 hp diesel drive with a 300 kw diesel driven generator as auxiliary power. Speed of 13 knots and 1000 mile cruising range and accommodation for 17 officers and 17 crew members are other requirements. This is what the Bureau of Ships proposes, but as yet funds are not appropriated for construction.

A SMALL fireboat 75 ft long and 20 ft beam with a 100 hp diesel for pumping and propulsion has been delivered to the City of Pittsburgh by Paasch Marine Service of Erie, Pa.

AT THE National Motor Boat Show held in New York City in January ten makes of diesels were exhibited compared to eleven makes of inboard gasoline motors indicating interest in pleasure craft diesels about equal to interest in spark ignition engines for similar service. Diesel manufacturers drop out of and return to Boat Shows whereas gasoline motor makers are consistent displayers up to the time they go out of business. Outboard outnumbers either gasoline or diesel exhibitors but one big one was a diesel for commercial services, thus evening up the score for the two basic types.

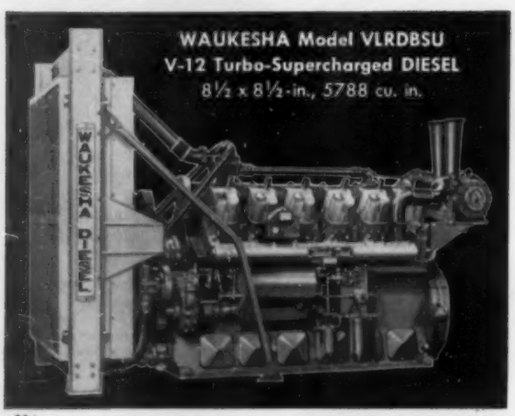
INTERESTINGLY, only one steam powered vessel is listed in the current miscellaneous group of vessels under construction to American Bureau of Shipping Classification while 32 are diesel or diesel electric propelled. The one steamboat has twin screw Uniflow engines of 4000 hp. Diesel boats in domestic services frequently exceed this power as for example the 200 ft 4320 hp towboat building for the Mississippi Valley Barge Line at the Dravo yard in Pittsburgh.

ANOTHER new dragger powered by a GMC 6-110 diesel is the 64 ft 10 in. long *Acadian Pal* recently launched from the yard of A. F. Theriault & Son, Ltd. of Meteghan River, Nova Scotia. This fine boat with 17 ft beam and 9 ft depth of hull is equipped with the most modern fishing and navigational devices and will be used for scalloping or swordfishing.

AN INTERESTING example of the diesel as auxiliary power in sailing yachts is the GM 4-51 installation in the yacht *Adriane* completed recently at the Palmer Boat Yard, Stonington, Conn. for Ferdinand Jelke III. This attractive motor sailer is 41 ft 8 in. long. Her 240 gal. fuel tank will give her 80 hours under power at 8 knots. With a sail area of 575 sq ft she performs well under canvas.

AN EXAMPLE of how the Fisherman's Loan Board plan works in Nova Scotia is the financing of construction of the longliner *Laura Ellen*, 50 ft 11 in. long 16 ft beam and 8 ft deep of 53 gross tons

Brewster-Bartle Drilling Co. Inc. use WAUKESHAS on "Trinity Bay" inland barge on South Louisiana coast



● Three VLRDBSU Waukeshas do the drilling and pumping here. They're big... and equipped with exhaust-driven dual turbo-chargers for extra power that's extra-smooth. Rugged for heavy duty, but compact... and yet simple in design for complete reliability with high fuel economy and low upkeep. They're 12-cylinder, 60-degree vee, four-cycle, 5788 cu. in. full Diesels with counterbalanced crankshafts. Send for Bulletin 1663.

For lighting and auxiliary power there are two Waukesha WAKDB 100 KW Enginators. These accurately balanced, conservatively rated Waukesha Diesel engine-driven generator combinations supply a smooth, steady flow of power for continuous duty. Other Waukesha Enginators in capacities from 600 to 50 KW. Send for Bulletins.

324

WAUKESHA

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and powered by a Leyland diesel. The boat was built by John McLean & Sons, Ltd. of Mahone Bay, N.S. for Calvin Keizer & Sons of Lunenberg and is the fourth longliner similarly built by this well known shipyard.

IT APPEARS that the U.S. government fisheries loan program will stimulate purchase of diesels in New England for repowering fishing craft. About 75 applications have been made for loans from the $10,000,000 revolving fund and approved loans to four owners amounting to $117,000 have been granted for up grading gear and vessels.

THE 55 ft trawler *Gannet*, powered by a Detroit GM diesel model 6-110 has been delivered to Dick Abbott of Freeport, Long Island by the Morehead City Shipbuilding Corp. of Morehead, N.C. A 3 kw Onan diesel generating set furnishes auxiliary power.

THE SECOND of two Navy tankers of 3200 ton capacity has been launched at Staten Island yard of the Bethlehem Steel Company. Designed for Arctic service, they are vessels 285 ft 7 in. long, 60 ft 11 in. wide and 26½ ft depth with twin screw diesel-electric drive. The government has not disclosed many other particulars as yet.

THE Richmond Gas and Electric Company of Staten Island, New York has purchased a new Fordson diesel driven Major with back hoe and blade for trenching and back filling. H. A. Stein of Mount Kisco, New York made the sale.

A FORDSON Major, diesel equipped tractor on rubber has been purchased from H. A. Stein of Mount Kisco, New York by Romeo & Associates general contractors of Tuckaho, New York. This unit is equipped with a loader and back hoe.

ANGELO Formichelli, general landscaper of Bronx, New York, has a new Fordson Major, diesel driven equipped with Gannor Earthcavator and loader for grading and leveling. The equipment was sold by H. A. Stein of Mount Kisco, New York.

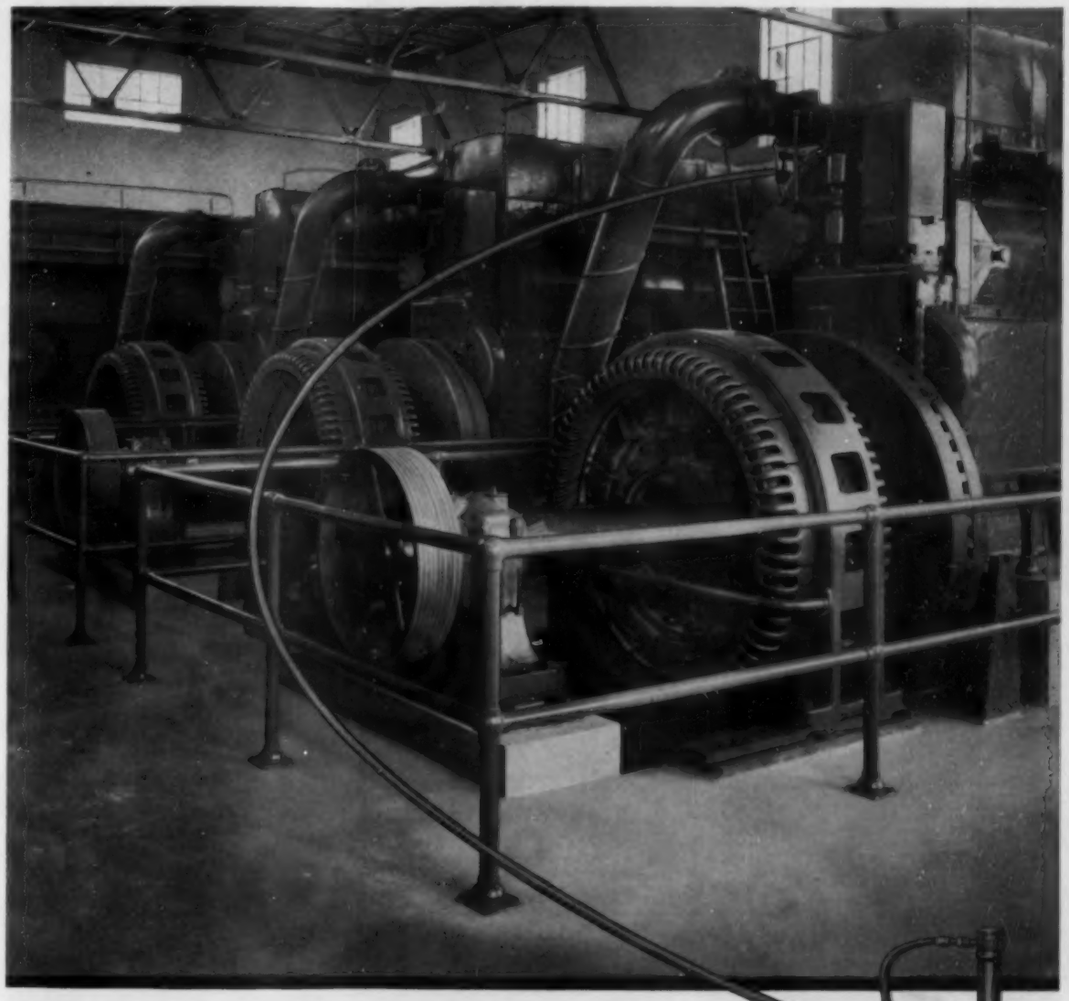
EBASCO Services has purchased a 150 kw generating set for Columbus and Southern Ohio Electric Co. from Griffin Equipment Co. of New York. The engine is a General Motors diesel Model 6-110.

A 60 kw diesel electric generating set has been sold by Griffin Equipment Co. of New York to August Jud Engineering Co. for the Suffolk County Water Authority of Kings Point, New York. This set is unique in that it is equipped with a Hydrostarter hydraulic starting system. The engine is a General Motors Model 4061A and the generator is a Delco.

THE MERRIT Chapman & Scott Corp. of New York has purchased a P & H Shovel, Model 1055, Caterpillar diesel equipped for use in Connecticut. The Casey Gesner Equipment Corp. of Hamden, Conn. made the sale.

Detroit Diesel Appoints Griffin

Harry J. Hush, president of Griffin Equipment Corp., New York City, announces that Griffin Equipment Corp. has been appointed exclusive territorial distributor for marine engines of the Detroit Diesel Engine Division of General Motors Corp. This appointment is in addition to the exclusive territorial distributorship of Detroit Diesel's industrial diesel engines, which Griffin has held for many years. Griffin's territory is the Greater New York Metropolitan area—including New York City, all of Long Island, Southern New York State and the Northern half of New Jersey.



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SINCLAIR RUBILENE OILS

Florida Diesel News

By **Ed Dennis**

CONGRATULATIONS are again in order to L. C. Ringhaver, president of Diesel Engine Sales, St. Augustine, upon the launching of the #600 trawler. This is a total of 600 vessels in less than 14 years. The 67 ft trawler was christened the *Mary Call Collins* in honor of the gracious wife of Florida's governor, Le Roy Collins. Powered with a Caterpillar D342 diesel, it, along with nos. 601 and 602 will go to the Versaggi Shrimp Co.

ELLIS Diesel Sales & Service, Ft. Lauderdale, assembled a General Motors 6-71 diesel, rated 170 hp, with a direct drive to a Fairbanks-Morse model K62535 10x8 water pump rated 2500 gpm on steel skids complete with radiator and fuel tanks for Davie Gardens Nursery to be used as a mobile irrigation unit.

AN International diesel W400 tractor, engine model 281, rated 50 draw bar hp, with a torque amplifier to pull a Tampo roller used on road construction work. This increases the J. D. Manly Construction Co., of Leesburg, fleet to 4 being used on this project.

AN Allis-Chalmers Buda diesel is being used for power in the new dredge built by Service Machinery of North Miami for Alva Dredging Co. of Fort Myers. The model DA844 diesel is rated 180 hp and drives a Maddox 8 in. intake by 8 in. discharge sand pump through a C. R. 12 A Cottoha transmission. The cost is about $8.00 an hour to operate it.

FOR Port au Prince, Haiti, two Caterpillar D315 and one D318, all with power take-off, to be used for irrigation work and two D311 Cat 37.5 kva 240/480 volt generating sets, to be used in the back land farming districts.

PETTER diesels are being used to drive the 1500 watt generators and the Jabsco centrifugal bilge pumps on the new 67 ft trawlers launched by Diesel Engine Sales, St. Augustine, for Sahlman Seafoods Inc. of Fernandina Beach and for St. George Packing Co. of Ft. Myers. Both the *North Easter* and the *John Williams*, have D342 Caterpillar diesels for main propulsion.

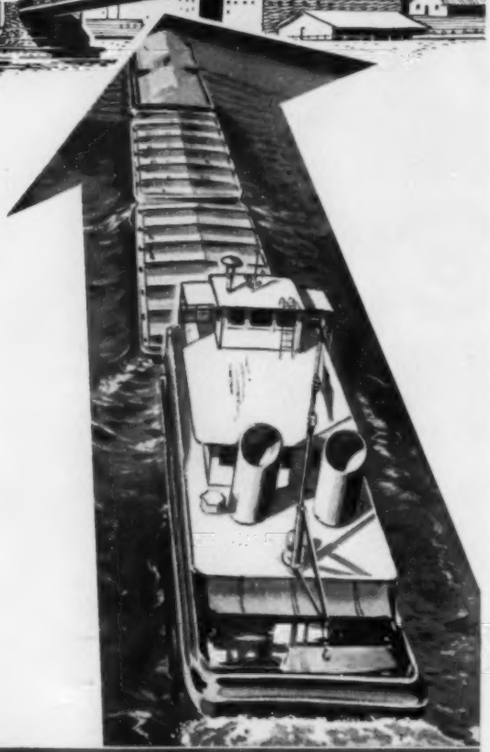
THE Central Machinery & Supply Co. of Miami has been appointed distributor for South Florida for the Sheppard line of diesel engines.

AN 80 kw Katolight light plant was installed in the new Citizens Federal Savings & Loan Assn. Bank building in Hialeah, by N. J. Mc Nair. It is powered with a GM 4-71 model 4030-C diesel and includes automatic start and transfer of power upon power failure and all safety shut down devices.

AT Jacksonville, the Florida Br. Detroit Diesel Engine Div. GMC supplied their 6-110 models to R. A. Wilson of Tampa, McCarthy Camden Co. of St. Marys, a 4-71 for the *Capt. Hank* of Brunswick and a 60 kw generating unit for the 475 foot TMT *Carib Queen*.

THE CITY of Ft. Lauderdale will receive four D315 Caterpillar 40 kw diesel generating sets and one D311 30 kw unit, all skid mounted with radiators. The switch gear will come from Tampa Armature Works. The units are to powerdrive electric motor driven water pumps in the water department, from Shelley Tractor & Equipment Co.

FOR Freeport, Grand Bahama Island, three generating units, skid mounted etc., each powered with twin General Motors 165 hp 71 series diesels to a 200 kw General Electric generator. These are to be used in the development of the huge new shipyard on this island; from Peninsular Armature Works, Miami.



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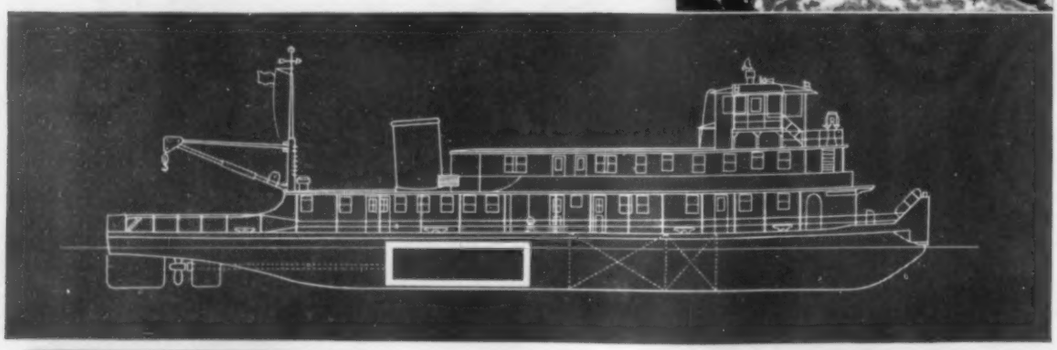
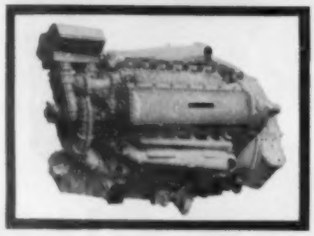
The locked engine room—dream of every towboat operator, builder and engineer—is brought nearer to reality by the use of Napier Deltic engines. On Deltic-powered towboats you can have complete, instrumented Pilot and Engineers' Remote Control Stations—a big step towards marine automation. There are other equally important reasons for using Deltics. They reduce vessel layup and increase earning capability. When a major overhaul is needed the low weight and compactness of the Deltic permit engine replacement in a few hours. Deltics (825-2,500 s.h.p.) have the best marine Diesel power/weight ratio in the world. Get in touch now with Napier's representative. He'll tell you more about the advantages of using Deltic Diesels.





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CRC D23

THE SELF Towing Co. of Mobile, Ala., had two model NHM 600 Cummins diesels installed in a work boat. These 6 cyl 5⅛ x 6 inch engines deliver a max. 275 hp each at 2100 rpm and were sold by the Cummins Diesel Engine Sales Inc. of Birmingham, Ala.

A Nordberg diesel to be installed for the City of Vero Beach, 8 cyl, 29 in. bore with a 5400 kw Elliott generator. This is to be a dual fuel engine in hopes that when and if Florida's much needed natural gas pipeline comes, it will have an offshoot to this area.

AN additional twenty Cummins dieselized International Harvester #200 cab over engine hiway tractors for Great Southern Trucking Companys over the road fleet. Each powered with JT6B models rated 175 hp at 2500 rpm with 8 speed road ranger transmissions.

THE *Fernando-Flo* of Havana, Cuba, a self propelled sand barge of 120 ft length, was repowered at Dade Drydock Co. with a model D397 Caterpillar marine diesel engine rated 360 hp at 1225 rpm. Two 5 kw Petter diesel generating sets are used for auxiliary purposes.

THE *L&M*, a 60 ft shrimp trawler, was launched at the Morehead City Shipbuilding Corp. It is powered with a model NTO6M Cummins diesel which develops 262 hp at 2100 rpm. It has a Southern 45x30 four blade propeller.

AT PERRINE, in the Redlands, the *Big W.* farms took delivery of a portable water pumping unit mounted on a trailer. The Construction Machinery pump, SS6-H 100 rated 1500 gpm at 90 lbs sq in. at rainhead, is powered with a D326F Caterpillar diesel supplied by Shelley Tractor & Equipment Co.: used for irrigation purposes.

THE 67 ft *Lady of Good Voyage*, of Fernandina Beach, was recently launched by Diesel Engine Sales of St. Augustine, who also launched the *Theadora S* fishing out of Wildwood, N. J. Both are powered with D342 Caterpillar 210 hp diesels. For auxiliary purposes a 5 hp Petter diesel drives a Winpower generator.

NEW Cummins dieselized road construction equipment included a Galion grader with a model JT6BI at 175 hp for R. H. Wright & Sons of Ft. Lauderdale and Volusia County Commissioners took delivery of a smaller model with a JM6BI.

A Waukesha diesel model 195 DLC powers the Jaeger Front End Loader delivered to Constructors of Florida Inc. This six cyl 4x4 diesel delivers 76 hp at 1800 rpm.

Assistant Sales Manager

James L. Cullen, 1017 Lee Street, Evanston, has been named Assistant Sales Manager of the Hose Division of Flexonics Corporation, Maywood, Illinois, according to an announcement by E. W. Driedger, Sales Manager of the division. Mr. Cullen, employed at Flexonics since 1951 has been the sales representative for the company's Hose Division in the Chicago Area. In his new position he will assist in supervising sale of hose products of flexible metal, synthetic and plastic materials.

Flexonics Corporation, 55 year old manufacturer of flexible metal hose, control devices and aircraft ducting assemblies, recently purchased the Flex-O-Tube Division of Meridan Corporation, Inkster, Michigan. The Flex-O-Tube division manufactures hydraulic, pressure, vacuum, fuel and lubricating hose assemblies. Mr. Cullen presently is planning a national distributor organization for the line of Flex-O-Tube products. His supervisory duties include hose products manufactured in all of the Corporation's eight plants in the United States.

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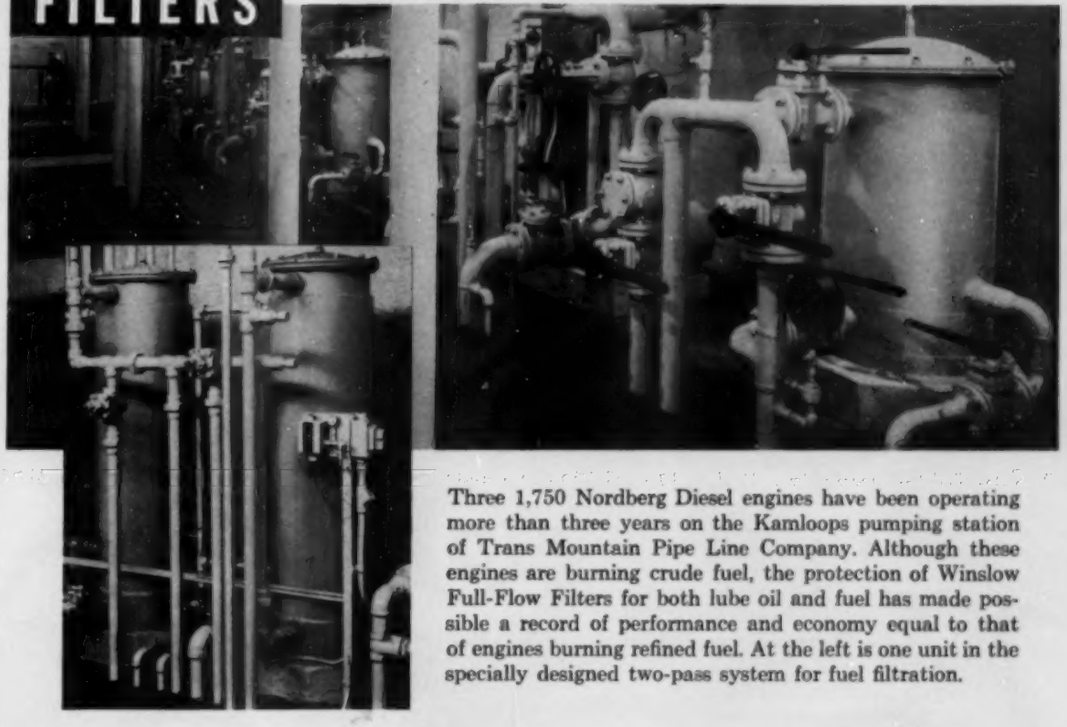
Case History Report No. 34 Shows Why Engines Protected by WINSLOW FILTERS Last Longer



Three 1,750 Nordberg Diesel engines have been operating more than three years on the Kamloops pumping station of Trans Mountain Pipe Line Company. Although these engines are burning crude fuel, the protection of Winslow Full-Flow Filters for both lube oil and fuel has made possible a record of performance and economy equal to that of engines burning refined fuel. At the left is one unit in the specially designed two-pass system for fuel filtration.

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After 20,000 hours operation in a three-year period, the first Nordberg Diesel in a Trans Mountain Pipe Line station was recently overhauled. In spite of the use of crude fuel, and difficult operating conditions, the engine was in such good condition that only $300 worth of replacement parts was required. This is another striking example of the long engine life and the substantial savings in overhaul time and replacement costs when dirt, acid, moisture and other impurities are removed by Winslow Filters. Standard or special installations of Winslow Full-Flow Filters can give you equal engine economies. Please write for complete information.

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Inland River Reports

By A. D. Burroughs

ERNA A., reported the first of quadruple-engine towboats equipped with Allgire's Universal Boat Drive, designed to eliminate rudder use, is on the water powered by four Hercules model DFXE diesel engines rated at 700 hp. Owned by Allgire Rudderless Tug Boat Company, this 65x21 ft vessel has superstructure built by Kranz Automotive Body Co., and steel hull from Humboldt Boat Service both of St. Louis.

NEWEST and ninth addition to the famed Chotin fleet is the 140x30 ft powerful towboat, the *Cypress*, with 4200 hp developed from twin 12-cyl Model 498 GM (Cleveland) turbocharged engines. Destined for oil trade service, she is owned by Chotin Transportation, Inc., and built by J & S Shipyard. Falk reverse-reduction gears and Delco generators are listed among the quality equipment on this ultra-modern craft. See detailed discription in March issue.

JAMES BOWIE, 132x32 ft newcomer christened in mid-January at New Orleans is scheduled to be the first of triplets built by American Marine Corp., (formerly Alexander Shipyard) for owners Commercial Transport Company, Houston, Texas. The rated 2400 hp comes from two 1200 hp GM (Cleveland) 12-567 engines.

ON OUR first 1957 river ramble, we observed with considerable interest the activities of the newer vessels, with the busy *O-Kan* among the first seen. A typical Ram-type vessel, small and mighty, the propulsion power for the tow upbound on the Ohio came from White Motor Company's Atlas engines. The craft is owned by Point Towing Company.

THE NEW triple-screw *Ovec* was in action in the area, too, more proof of the power of 1956 efforts. Built by St. Louis Shipbuilding and Steel Co., owned by Ohio River Company, the rated 3240 hp was being developed by Baldwin-Lima-Hamilton engines.

WE CAUGHT our first sight of the new *Shuttler* built by Sturgeon Bay Shipbuilding and Dry Dock Company, busy on the Ohio River waters with the propulsion power rated at 1100 developed from her pair of Caterpillar engines.

THE ACTIVE and new *Carcrosse* was spotted upbound moving with good time from power developed from twin Cooper-Bessemer engines rated at 2400 hp. This vessel owned by Cargo Carriers, was completed last year at St. Louis Ship.

IN THE Illinois Waterway area, it's the *George W. Lenzie* getting the spotlight. Newcomer of 1956 to the Material Service fleet, built by Calumet Shipyard, the 1600 hp developed from Nordberg Supairthermal engines produce power for the rough operation required in these waters.

ANOTHER cause of comment in this Illinois waterway area is the still-new *Sandra Marie*, built in 1956 by Christy Corporation for S and S Marine Towing Company. Power for this busy boat comes from the main engine with the Kahlenberg Model E turbocharged identification, producing a rated 700 hp.

HEADING for New Orleans, we met Rose Barge Lines' *Cindy Jo*, a neat performer built by Calumet Shipyards for this Marselles, Ill., firm with the 1600 hp coming from Superior engines, one more 1956 production proving its value.

WE MISSED the *Shark* by a day or so when reaching southern waters. We'd hoped to get a glimpse of this towboat in operation. Built by Calcasieu Shipbuilding Corporation last year, for owner Coastal Towing Company, favorable reports have come our way on the operation of the two Allis-Chalmers Buda engines rated at a total 1000 hp.

TWO Enterprise engines were proving their effectiveness providing propulsion power for the new *Alex Barker*, active in the bayou trade doing duty for owners Barker Barge Line, Louisana. Built by Bollinger Machine Shop and Shipyard, this twin-screw worker has a total 1000 hp.

THE *Etta Marie* was at work, pushing a load for her size, with her 1800 hp developed from three Cummins engines. Built by Greenville Manufacturing and Machine Works, and owned by Port City Towing Company, the vessel is small, 72 x 24, but powerful with the triple engines.

APPRECIATION is expressed here for the fine picture of Coyle Lines' still-new *Dallas*. A beauty as well as a powerful pusher, the vessel was built last year at Arnold V. Walker yards with two Fairbanks-Morse engines providing the 1170 hp.

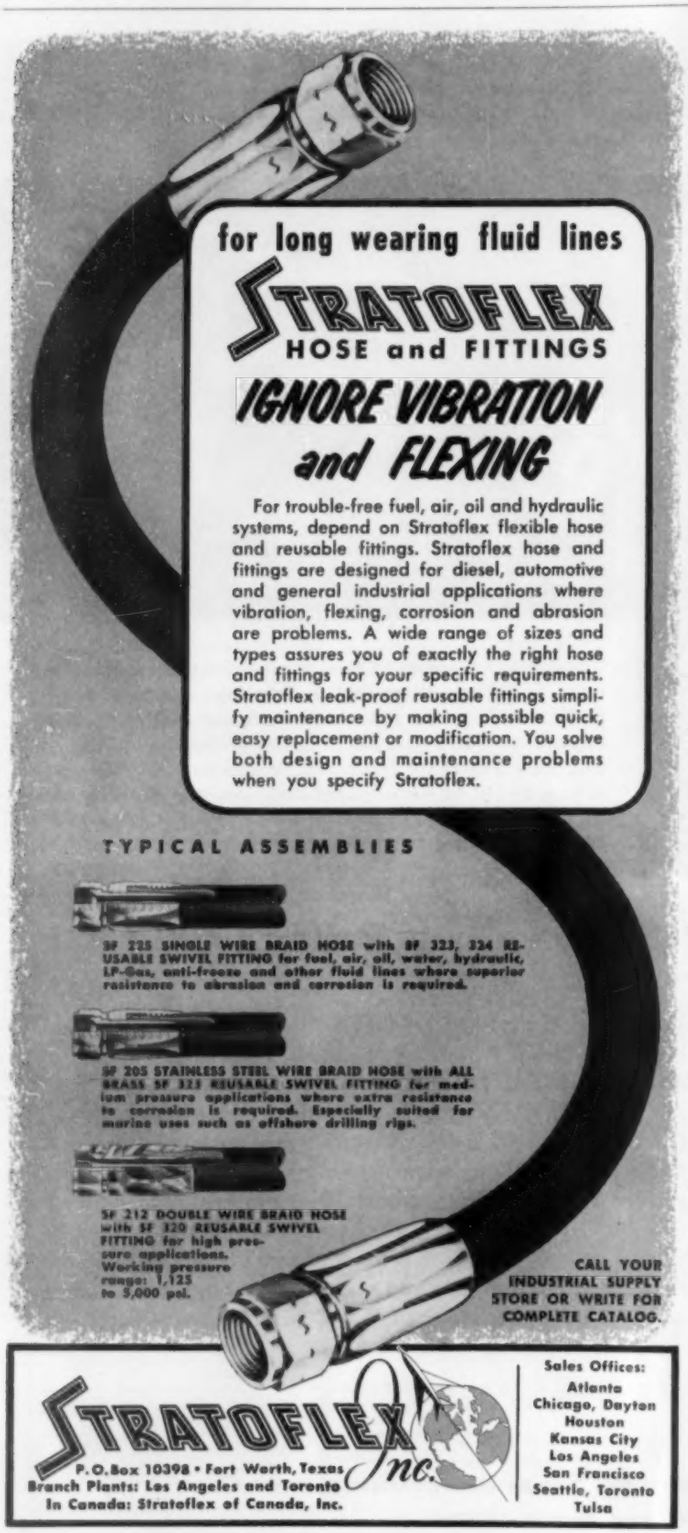
AT Nashville Bridge Company, excitement reigned high regarding the high-powered vessels under construction or on order, with the *Toltec* ready for the finishing touches. Constructed for Lea River Lines, three Enterprise engines will provide the 3975 hp.

EXPECTATION runs high, too, at Nashville Bridge regarding the eventual completion of what is anticipated to be the most powerful of all inland river towboats, the 5400 hp for a twin-screw craft designed for Nashville Coal Company. This power is to be developed from a pair of GM engines, Model 498.

ANOTHER powerhouse is on the water, completed recently at St. Louis Shipbuilding and Steel Co., for the Ohio River Company. Named *Queen City*, measuring 164 x 44 ft, the 3240 hp is provided by Baldwin-Lima-Hamilton engines.

Field Engineering Manager

The Maxim Silencer Company of Hartford, Connecticut, subsidiary of Emhart Manufacturing Company, has announced the appointment of Lee J.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Doyle as Manager of Field Engineering. Mr. Doyle, long a leader in the acoustical field, is a member of the Acoustical Society of America and of the Institute of Aeronautical Sciences. He has had an unusually broad experience in the field of aircraft engine silencing, having spent ten years with the Industrial Sound Control Corporation before joining Maxim. He attended Case University in Cleveland and has studied acoustics at the Massachusetts Institute of Technology. Mr. Doyle will work with Maxim Representatives in the field on problems of both industrial and aircraft silencing.

Company Purchased

Diesel Parts Co. of California, John E. Randono, proprietor, 1800 East 12th Street, Oakland, California, has purchased outright the entire Saco Engineering Division of Surplus Automotive Co., now dissolved, and is moving the facilities together with Saco Engineering staff and personnel from Chicago to Oakland, California where he will perpetuate and enlarge the activity of producing precision replacement parts for the GM Model 71 diesel engine. Prominent among the several parts numbers which will be distributed by the new ownership are Hi-Pop Injector Valve Springs; Saco Cam Follower Roller and Pin Sets, and 6-71 Sea Water Pump Impellers.

All-Aluminum Towboat

An all-aluminum welded towboat, believed to be the first heavy duty workboat of its type ever built, will be constructed by Bryant Boats, Inc., of Bayou LaBatre, Ala., in cooperation with Kaiser Aluminum and Chemical Corporation, and Kennedy Marine Engine Company of Biloxi, Mississippi, distributors of General Motors diesel engines. The vessel is being designed by Friede & Goldman, Inc., Naval architects of New Orleans and will be built to ABS classification and inspection, and any applicable requirements of government agencies.

James W. Calvert of Calvert Marine Services, New Orleans, sales representative for Bryant Boats, said the vessel will be 55 ft in length, powered with twin GM model 6-110 diesel engines, and will be designed for unusual shallow draft. Bayou LaBatre, where the first all aluminum towboat will be constructed, has been a shipbuilding center for more than two centuries. It was in this quaint fishing village near Mobile Bay that early Americans built the schooners and shallops, blunt nosed shallow draft sailing craft, used for trading in the Gulf of Mexico and Caribbean Sea.

The 55-ft towboat will be used extensively in the bayous and marshland oil fields of South Louisiana and the aluminum construction is expected to give the vessel 20 percent less draft with the same dimensions and horsepower of the conventional workboats built of steel. Captain Carl Lamb, chief engineer of Friede & Goldman, said the use of aluminum in hull construction will mean less corrosion and, as a result, lower maintenance cost throughout the life of the vessel in waterways service.

"Because aluminum withstands shock and vibration better than other metals," he said, "the all-aluminum hull will have less noise and vibration. The vessel should have higher speed at the same power, or the same speed at a reduced power, resulting in lower fuel cost and engine maintenance. The aluminum alloys to be used in the construction of the vessel are appreciably more resistant to sea water corrosion than steel. The same vessel operating in fresh or brackish water would not need paint of any kind, while in salt sea service it would be protected only against barnacles and sea growth by the application of conventional anti-fouling paint," said Captain Lamb.

ITS NEW

Baltimore's fireboat *Mayor Thomas D'Alesandro Jr.* has four O-P's totaling 2640 hp. for propulsion and pumping service. Designed by Thomas D. Bowes, M. E., Naval Architect.

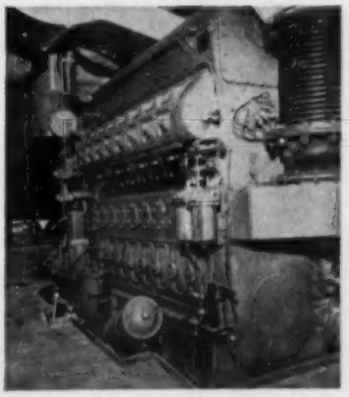
Floating Pumping Station Powered by Fairbanks-Morse Opposed-Piston Diesels

Fire alarms sounding today in Baltimore's expanding harbor area are quickly answered by the newest in fireboat performance. Cousin to land-based municipal pumping stations, the vessel is powered by a pair of 660 hp. Fairbanks-Morse Model 38F 5¼ Opposed-Piston Diesels. This highly maneuverable vessel sails smoothly at full speed, completely without vibration and crash-reverses in less than two lengths.

Another identical pair of O-P's power the two 10" F-M fire pumps that can throw 12,000 g.p.m. at 150 lb. pressure.

Only compact Opposed-Piston power could provide this performance, yet keep weight down for higher top speed.

On a fireboat—in your municipal power or pumping station—when the need is for dependable power produced economically, you cannot match the standard set by Opposed-Piston diesels from 200 to 2400 horsepower. Fairbanks, Morse & Co., Dept. DP-4, Chicago 5, Illinois.



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Michigan-Ohio News

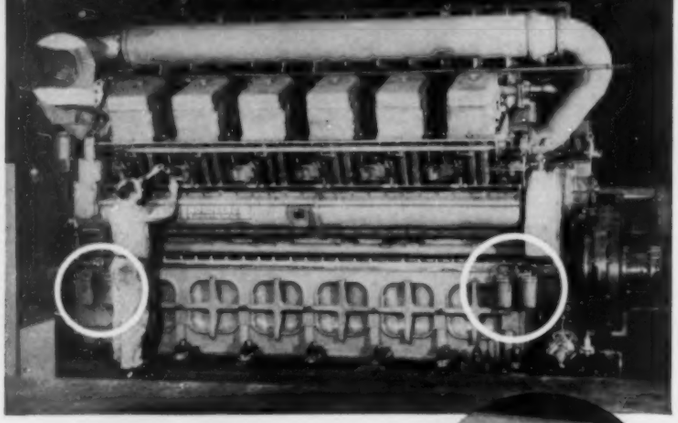
By J. W. Brown

AN Allis-Chalmers diesel with a Capitol 2 to 1 reverse gear was sold to F. G. Coggin of Detroit for installation in his new boat, which is now being built in Connecticut. The sale was made by Earle Equipment Company of Detroit.

A MODEL 3500 Manitowac equipped with a 4 yd clamshell and driven by a D337 Cat diesel has recently been sold to Great Lakes Steel Corp. by R. G. Moeller Co. of Detroit.

CUMMINS Diesel Michigan Inc. has installed a NHB600 Cummins diesel in a model LJ Mack truck for Mr. Thomas J. Kouch of Wyandotte, Mich.

NUGENT FILTERS
provide positive protection for Nordberg Diesels in rugged towboat service



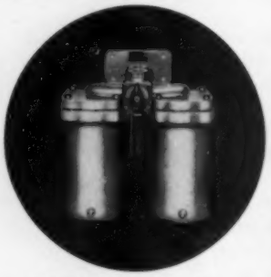
The four most powerful twin screw towboats ever to enter river service each derive main propulsion power from a pair of Nordberg *Supairthermal* 4-cycle Diesel Engines.

Nugent Duplex Filters were selected to provide these engines with efficient, economical filtration. Both the fuel oil system and lube oil for the supercharger get the positive protection of Nugent Laminated Disc Filters . . . which remove foreign particles as small as 2 microns.

Because valuable equipment demands this kind of protection, leading diesel manufacturers choose NUGENT FILTERS. A wide range of sizes and types are available to meet the most exacting requirements. Size for size, they provide 20 times more filtering area than any other filter. Full or by-pass filtering is possible with the same unit and simple piping makes installation easy.

For longer life and better service from your diesel . . . look to Nugent. Write today for complete information.

The Nordberg Supairthermal Engines powering this towboat are equipped with Nugent Filters.



Filters installed on the Nordberg Diesels are Nugent 1555BF-1R Laminated Disc type.

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3441 Cleveland Street Skokie, Illinois

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RAY C. Call, Inc. of Steubenville, Ohio has recently delivered a 200 kw direct current generator set powered by twin 6-71 GM Detroit Diesel engines. The delivery was made to Weirton Ice & Coal Co. of Weirton, W. Va.

THE CITY of Mt. Pleasant, Mich. has accepted delivery on a Galion 450 tandem Motor Grader. The grader is powered by an IH model UD-350 diesel, and was delivered by the Detroit branch of Wolverine Tractor & Equipment Co.

WISEMAN Excavating of Detroit has accepted delivery on an Allis-Chalmers HD-11B tractor. The sale was made by Earle Equipment Co. of Detroit.

THE UNION Telephone Co. of Dowagic, Mich. has purchased a 60 kw GM diesel standby generator set. The generator set was sold by Peninsular Diesel, Inc. of Detroit.

GORDON Drilling Co. of Mt. Pleasant, Mich. has purchased two Cat D375 diesel engines from Michigan Tractor & Machinery Co. The Cat diesels are set up to run on crude oil, and are equipped with gasoline starting engines and automatic oil pressure and water temperature shut-offs.

R. G. MOELLER Co. of Detroit has sold a 99L Austin-Western grader equipped with a torque converter and driven by a model 4-71 GM Detroit diesel to the Ford Motor Co. of Dearborn, Mich.

CUMMINS Diesel Michigan, Inc. has installed a model NHB600 Cummins diesel rated at 200 hp in a Diamond T truck for Mr. Thomas Tolmich of Detroit.

THE CITY of Troy, Michigan has purchased a model HUD Hough Payloader powered by a Hercules diesel from the Detroit branch of Wolverine Tractor and Equipment Company.

PENINSULAR Diesel Inc. of Detroit has delivered two 75 kw GM diesel generator sets to Farmers Chemical Co. located at Kalamazoo, Mich. The generator sets will be used for utility power.

MACK Motor Truck Corp. of Dearborn, Mich. through their Grand Rapids distributor has sold a model B61T Mack truck driven by a 673 thermodyne diesel to Mr. Charles Zichterman of Grand Rapids, Mich.

A MODEL NHB600 Cummins diesel has been installed in a C-65 Autocar for Fluid Fuels Co. of Detroit, by Cummins Diesel Michigan, Inc.

A 200 kw DC generator set, powered by a model 12103 Twin 6-71 GM Detroit diesel engine has been delivered to Hanover Red Ash Coal Co. of Hanover, W. Va. by Ray C. Call, Inc. in Steubenville, Ohio.

OSCEOLA County Road Commission of Reed City, Mich. has placed into service a Hough HH Payloader powered by a DJXB Hercules diesel. The payloader was sold by the Detroit branch of Wolverine Tractor and Equipment Co.

JESS Stanley Gravel Co. located at Houghton Lake, Mich. has purchased a GM model 62406-RD Detroit diesel engine to power their Cedar Rapids Gravel Plant. The diesel was sold by Peninsular Diesel, Inc. of Detroit.

A TURBOCHARGED Cat D397 diesel has been placed into service by the Saginaw Asphalt Paving Co. to supply power for their asphalt plant. The delivery was made by Michigan Tractor & Machinery Co. of Detroit.

MR. G. TOCCALINO, a paving contractor from Detroit, recently purchased a Super 88 Austin-Western Motor Grader powered by a model UD-14A IH diesel. The grader was delivered by the R. G. Moeller Co., of Detroit.

CUMMINS Diesel Michigan, Inc. has installed a model JT-6-B Cummins rated at 175 hp in a WC-22 White truck for Mr. Marshall Rowlette, a broker for Alger Trucking Co. of Detroit.

A MODEL HOD Hough Payloader powered by a Hercules diesel engine has been placed into service by the International Salt Co. of Detroit. The Payloader was sold by Wolverine Tractor & Equipment Co. of Detroit.

PENINSULAR Diesel Inc. of Detroit has sold a GM 62406-RD diesel to power an 8 in. Morris Dredge pump to Poupore & Gilmartin Equipment Co. in Detroit.

DeLuxe Moves Sales Headquarters

DeLuxe Products Corporation announces the transfer of the sales department to 1201 Michigan Blvd., Racine, Wisconsin. Manufacturing and shipping operations for DeLuxe Oil Filters and Oil Filter Cartridges will continue at LaPorte, Indiana, but all future customer transactions will be handled through the new Racine office. It is requested that all orders, correspondence, telegrams and telephone inquiries be directed to the Racine address.

This relocation, according to company officials, will afford the opportunity to

better serve customers through a closer correlation with both the administrative function and a new, advanced research and engineering program of the parent corporation, The Walker Mfg. Co. of Wisconsin.

Two key men in the DeLuxe sales organization, Mr. Cecil N. Bentley, Vice President, and Mr. C. O. VanVactor, Assistant Sales Manager, will continue to maintain residence in LaPorte, but can be reached through the new sales office in Racine. Mr. Robert K. Ruland, Vice President and General Sales Manager, and Mr. O. M. Hoyt, Marketing Manager have transferred to the new Racine headquarters.

Waverly Buys Enterprise V-Engine

First domestic installation of the recently announced Enterprise RV-16 engine will be in the municipal electric generating plant of Waverly, Iowa, according to Enterprise Engine & Machinery Co., San Francisco. A single turbocharged 16-cylinder engine, fitted for dual fuel operation, will drive a 3,500-kw generator. For this application, the RV-16 is rated 4,890 hp at 143 bmep and 360 rpm. According to terms of a $532,474 contract awarded in December 1956, the new engine will be installed during the summer months of this year, to commence operation in September. Additional contracts awarded by the city council of Waverly cover other improvements to the distribution system, including $56,715 for transformers and $62,145 for generating plant inter connections and a new high voltage distribution line.

Enterprise announced the RV-16, by far its most powerful engine, just last year. Unusual design permits the eight pairs of pistons in opposing V-banks to lie directly opposite each other, resulting in an extremely compact engine. With a top rating of 7,700 hp at 400 rpm, the RV-16 is one of the world's most powerful 4-cycle diesel engines for its size. The Waverly installation, coupled with its 3,500-kw Elliott generator, is therefore believed to be the largest of its type in the country.

Waverly's present generating capacity totals 5,940 kw at two plants, including six diesel and dual-fuel engines and three small hydroelectric units. Firm dependable capacity, which neglects the hydro and one 1,350-kw dual fuel unit, comes to only 4,095 kw, barely in excess of peak demands in 1955. Studies by Associated Consultants, Minneapolis show an average annual increase in demand of about 9 per cent, indicating that existing firm capacity will very shortly become inadequate. The new Enterprise engine and its generator will boost total capacity to 9,490 kw and the dependable capacity to 5,445 kw. More than enough for immediate needs, the greatly enlarged total will provide firm reserves for several years to come.

Following the pattern of previous engines installed in 1948 and 1952, the new Enterprise will operate primarily on natural gas in conjunction with oil fuel. It will be equipped with four Brown Boveri turbochargers and two Maxim 40-MUS exhaust silencers. Actual installation, including foundation preparation at Waverly's West Plant, is being handled by Power Equipment Co. of Kansas City.

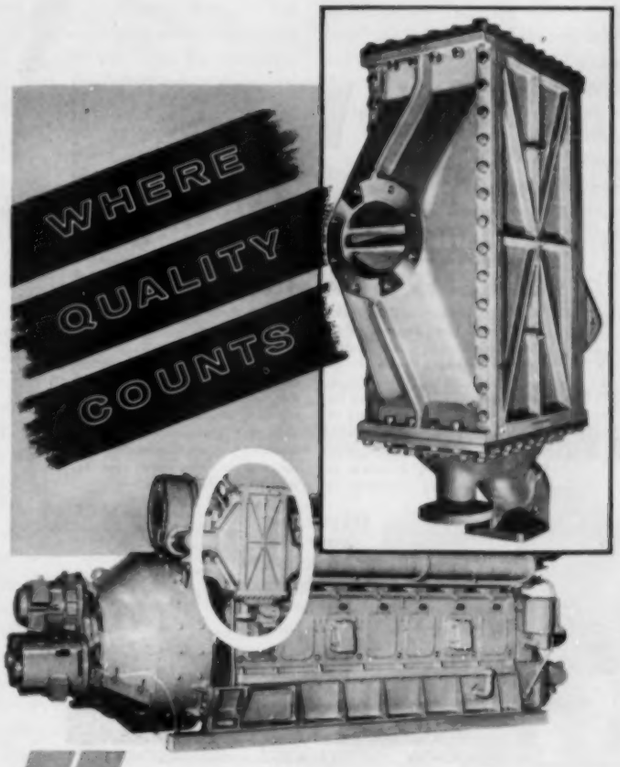
Dravo Orders Nordbergs

Nordberg Manufacturing Company announces the receipt of an order from the Dravo Corporation, Pittsburgh, Pa. for a pair of V-type, Supair-thermal diesel marine engines. These engines will be installed in a 200 ft twin screw river towboat to be built by Dravo for Olin Mathieson Chemical Corporation. This is the fourth pair of Nordberg Supairthermal engines to be purchased for large towboat propulsion in the past several months. The pair of engines now on order are each rated 3000 shp at 514 rpm and will operate at 175 bmep. The powerful V-type units have 12 cylinders of 13 in. bore and 16½ in. stroke.

The Olin Mathieson Corporation boat will operate on the Mississippi and Ohio Rivers transporting alumina between New Orleans, La. and Omal, Ohio, the site of a new Olin Mathieson aluminum plant. Dravo Corporation has completed two similar size towboats for Mississippi Valley Barge Lines; the *A. D. Haynes II* and *Valley Transporter* and a third boat is now under construction. The Olin Mathieson Corporation towboat will be ready for service in January 1958.

Plans Florida Outlet

W. Denis Kendall, president of American M.A.R.C. disclosed at a press conference in Miami, Fla. that multi-millionaire Arthur Vining Davis, who owns 72% of A.M.A.R.C. stock, is interested in establishing a South Florida branch. The Florida operation would be a combination assembly-manufacturing outlet for about 5 to 6 million dollars worth of their dieselized machinery for the eastern part of the United States and to the Latin American trade. American M.A.R.C. plans to build a half million dollar plant and to start production in 12 to 18 months. It will probably be built on property already owned by Mr. Davis and large enough for future expansion. The firm manufactures diesel engines for marine use, electrical units, irrigation systems and several other operations in the 5 to 25 hp range.

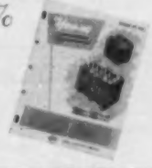


Young INTERCOOLERS

Help Cooper-Bessemer Engines to Operate at Highest Efficiency

Powerful turbocharged engines like this Cooper-Bessemer unit require the most efficient and reliable cooling of compressed air to help them maintain peak horsepower output. The two locomotive-type Young Intercoolers on this C-B power unit utilize engine jacket water in the coils to cool the compressed air as it passes over the fins.

While being compressed by the turbocharger, air increases in temperature in direct proportion to the degree of blower pressure. For top efficiency operation, intercoolers must cool the compressed air before it enters the cylinders. Young Intercoolers—in actual field operation—have been found to increase engine HP from 10% to 50% over supercharged non-intercooled engines.



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Creative HEAT TRANSFER ENGINEERS FOR INDUSTRY
Heat Transfer Products for Automotive, Aviation and Industrial Applications. Heating, Cooling, Air Conditioning Products for Home and Industry.
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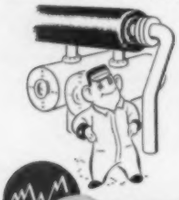
BURGESS-MANNING SNUBBERS

The Burgess-Manning Snubbing Principle has been engineered to effectively eliminate the costly and nerve-racking problem of noise and pulsation. We have, for many years, specialized in the science, cause and effect of noise and pulsation problems. We have adapted the Burgess-Manning Snubbing Principle to many and varied problems in every branch of industry to increase production, minimize maintenance, eliminate this serious source of compensation claims and improve public and employee relations. Burgess-Manning Snubbers are available with such plus features as: air cleaning—or, spark arresting—or, surge control—or, water separating—or, heat recovery.



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AD-15

Midwest Diesel News

By L. H. Houck

TWENTY-FOUR new White 9000 tractors with Cummins diesels have been placed in service by the ET & WNC Transportation Co., Johnson City, Tenn., as a result of their recent acquisition of Intercity Trucking Co.

A NEW tractor-trailer combination with a GMC 860 diesel was seen at Boonville, Mo., owned by G. B. Bradley, Wichita, Kan., it was leased to Freightways.

FARM TRACTORS are going diesel in a big way. McCormick Farmall, (IHC) 1957 models offer several diesel models and the new International tractors are powered with diesels in the 350 Utility model, a 3 plow tractor; International 450 and 650, pulling 4 and 6 plows, are diesel. John Deere, has a new 1957 model, 720 with new diesel engine. It set new hp records in Nebraska tests for row-crop tractors. John Deere also has a larger 1957 diesel model, the 820 which pulls 6 plows.

WALTER FARNUM, Pine River, Minn. has powered a sawmill with a 95 hp J-6-P Cummins diesel from Cummins Diesel Sales Corp., Hibbing, Minn.

RINEY-RYAN Tractor Co., Allis-Chalmers dealers at Fulton, Mo., a branch of the St. Louis office, has been sold to Cooke Sales and Service, Chillicothe, Mo., which also has a branch at Sedalia, Mo. Jack Wheeler is the new Fulton manager.

RYAN Equipment Co., Sikeston, Mo., recently delivered a TL-12 Allis-Chalmers diesel loader to the Cape Girardeau Special Road District, Cape Girardeau, Mo.

ROADWAY Motor Freight, Oklahoma City, has a number of White tractors with Cummins diesel engines on the St. Louis run.

DAVIS Construction Co., Boonville, Mo., recently took delivery on a new Koehring 1-yd crane from Van Koeppel Co., Kansas City, Mo., with a 4-71 GMC diesel engine.

MO.-ILL. Tractor Co., St. Louis, recently delivered an International TD 14 with Drott loader to Paul Krummel, St. Louis, for use in general excavating work.

WILBERT SMITH Lumber Co., Success, Mo., has purchased a 225 hp, Model HRIPS-600 Cummins diesel to power a Model 5 Corley sawmill. Sale was made by Cummins Missouri Diesel Sales Corp., St. Louis.

BRICK Special Road District recently bought an Allis-Chalmers motor grader with GMC series 71 diesel from Cooke Sales & Service, Sedalia, Mo.

SEEN at Sikeston, Mo.: Southern Plaza Freight Co., with International tractor powered with Cummins; at Fredericktown, Mo., East Tennessee Motor Freight rig (ETMF) White truck with Cummins diesel.

J. A. RIGGS Tractor Co., well known Caterpillar dealer, with branches at Ft. Smith, Jonesboro, West Memphis, McGehee, Camden, Ark., is building a new branch building at Jonesboro, which is an addition to present facilities. It will provide 6 additional work bays among other things.

GRANT BOYLES, Maycourt, Mo., has purchased an International TD-18 with dozer from Mo.-Ill. Tractor Co., St. Louis.

COOKE Sales and Service Co., Fulton, Mo., has delivered an HD-16 and a HD-11, Allis-Chalmers crawlers with Buda division diesels. The HD-16 is equipped with a Twin Disc torque converter. They went to contractor, Elton Hensly.

SEEN at Belleville, Ill.: Lone Star Motor Freight, Dallas, Texas, tractor and trailer, using GMC diesel.

JOHN R. BURTON, Montgomery City, Mo., bought an Allis-Chalmers HD-16 with Twin Disc torque converter for use in road contracting from Fulton branch of Cooke Sales and Service.

SOME Missouri farmers decided to stage their own test of diesels. They set up identical jobs of plowing, put a diesel tractor against a comparable gasoline powered job and got these results: The gasoline engine used 23 gallons of gasoline at 24 cents a gallon against the diesel's use of 12 gallons of No. 2 diesel fuel at 15 cents. The diesel pulled a 4-row cultivator and the gasoline job pulled a 2-row. The comparison was made in same make of tractor which provides an optional diesel engine.

SEEN at Cairo, Ill.: Kenosha Auto Transport Corp., new Diamond T with Cummins diesel, pulling Trailmobile trailer, with autos enclosed.

SCOTT County Highway Dept., Benton, Mo., bought an Allis-Chalmers diesel unit No. D-230 and mounted it on an Austin-Western gravel plant, from Ryan Equipment Co., Sikeston, Mo.

Facilities Expanded

Miehle Dexter Supercharger is expanding their facilities. The new addition

will be located in an area which has been leased from the J. I. Case Company's Main Works, Racine, Wisconsin.

Initially, this will be used for research and development of a new line of high pressure turbo-superchargers for automotive diesel engines. The present plant of the Christensen Machine Company, in Racine, will continue to manufacture the line of rotary positive blowers and superchargers, which are used by many of the diesel and gas engine builders, as well as various industrial machinery manufacturers.

The new line of turbochargers will supplement the present line of superchargers. Their high efficiency and increased pressure ratio will add considerably to the power output possible from internal combustion engines of all types and sizes. The new facility will have complete equipment for testing supercharged engines in addition to the various test sets for checking and calibrating turbochargers. Special machine tools for building prototypes will also be housed in the area.

The Miehle-Dexter Supercharger Division and the Christensen Machine Company, are part of the Miehle-Goss-Dexter group of Chicago, Ill. which was recently formed by the merger of Miehle Printing Press & Manufacturing Co., the Dexter Folder Company and the Goss Printing Press Company.

Assistant Chief Engineer

The appointment of a new assistant chief engineer was announced recently by Lawrence A. Zwicker, chief engineer, Harrison Radiator Division, General Motors Corporation. He is Claude V. Hawk and he will be in charge of the engineering phases of radiators, thermostats and heat exchangers. Mr. Hawk reported February 1 to Mr. Zwicker. John W. Godfrey will continue as assistant chief engineer in charge of air conditioning and car heaters, Mr. Zwicker announced.

Mr. Hawk was born in 1910 in Salt Lake City, Utah. He was graduated from the United States Naval Academy at Annapolis in 1931 and commissioned in the U. S. Navy. In 1938, he finished a year of post-graduate work at the Academy and in 1940 he received his Master of Science degree in Mechanical Engineering from the Massachusetts Institute of Technology. In 1955, he completed a course in Advanced Management at the Harvard School of Business Administration. A veteran of 25 years of service in the U. S. Navy, Mr. Hawk saw action as executive officer and commanding officer of a destroyer during World War II, and as ship's engineering and maintenance officer on the staff of the Air Force commander, Pacific fleet, during the Korean War.

In addition to his sea duty in the Navy, Mr. Hawk was machinery design superintendent at the Philadelphia Navy Yard for two years. He was head of the Heat Transfer Branch, Bureau of Ships, Navy Department, for three years. At the Bremerton Naval Shipyard he was superintendent of shipbuilding and repair. His most recent assignment was commanding officer and director of the United States Naval Boiler and Turbine Laboratory. Mr. Hawk retired this month from the Navy with the rank of Captain. He is married and has five children.

Roots-Connersville Promotions

Mr. D. A. Johann, Vice-President, Roots-Connersville Blower Division of Dresser Industries, Inc. has announced the following two promotions which are effective immediately. Glenn H. Crocker moves up to the position of Manager, Factory Sales from Chief Application Engineer, Centrifugal Equipment. He assumes responsiblity for all sales application engineering functions at the headquarters in Connersville. A native of Kansas, he is a member of the American Society of Mechanical Engineers and of the Compressed Air and Gas Institute.

Joseph L. Hylton has been promoted to the newly created post of Manager, Market Research. He previously held the position of Assistant to the Sales Manager and has been with the Company since 1947. A native of Indiana, Mr. Hylton is a member of the American Marketing Association and the National Industrial Advertisers Association.

Drum-Type Multiple Indicator

A new drum-type precision indicator for quick readings of variables at remote points has just been announced by The Bristol Company of Waterbury, Conn. This indicator uses the company's standard Dynamaster electronic instrument components. It is equipped with numbered push button switches on the front of the case, and can scan up to 48 remote points quickly. The revolving drum-type scale has a calibrated length of over 26 inches. Full-scale travel takes place in 4½ seconds. Offered primarily in Resistance Thermometer and Pyrometer models, it can also be supplied for measuring other variables. More details are available in bulletin P1245A, available on request.

ITS NEW

Sales and Service Directory

Hartford Machine Screw Company, Division of Standard Screw Company, Hartford, Connecticut, manufacturers of the Roosa Master fuel injection pump has released a new directory of their authorized sales and service agencies around the world. This rapidly expanding organization now stretches across the United States and Canada and into many corners of the world to provide service, when needed, for a rapidly expanding family of customers.

This up-to-date directory, the first to be published by Hartford Machine Screw Company lists Service Agencies and Central Distributors in the United States and Canada and Central Distributors in twelve foreign countries. Additional Service Agencies in foreign countries are available on request. Write direct to Roosa Master Fuel Injection Division, Hartford Machine Screw Company, Hartford 2, Connecticut for a copy. ITS NEW

WHY you can rely on Fulflo FILTERS

for micronic clarity of fuel and lubricating oils

Typical of Fulflo's pioneering "firsts" was the application of a *full-flow* lubricating oil filter to a high horsepower diesel engine. Today, Fulflo provides micronic clarity of both lubricating and fuel oils, on *all* horsepower stationary engines, mobile equipment, and in bulk filtration. You can rely on the filter that "grew up" with the diesel industry.

One of Fulflo's *exclusive* advantages is the Honeycomb Filter Tube. It gives you true *depth* filtration to any desired degree of micronic clarity. Fulflo will *not* remove additives. For replacements, always insist on *genuine* Honeycomb Filter Tubes.

Commercial Filters products also include a complete line of CFC (formerly Honan-Crane) Filters. They employ a variety of filter media such as Cranite (Fuller's earth) for removal of soluble contaminants as well as abrasive particles. Inexpensive Michiana Filters, with "throw-away" or repackable elements, are also available.

Commercial Filters Engineers will quickly demonstrate how you lower costs by prolonging engine life. For technical literature write to Department DS.

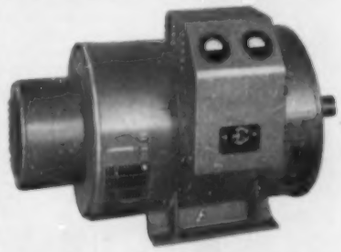
COMMERCIAL FILTERS CORPORATION
MELROSE 76, MASSACHUSETTS

Plants in Melrose, Massachusetts and Lebanon, Indiana

Power on tap!

A NEW 5 TO 50 KW "PACKAGED" GENERATOR

REG-AMP



REG-AMPS are available for 1800 and 1200 rpm operation, single- or 3-phase power, at all standard low voltages. REG-AMP shown has single bearing. Two bearing units are also offered.

It's a complete source of a-c electric power and the perfect mate for your engine

REG-AMP is a revolving field a-c generator with direct-connected exciter, built-in automatic voltage regulator, and a-c ammeter and voltmeter. It's factory assembled, internally connected, and tested.

Regulates voltage automatically. Simple relay constantly senses output voltage and keeps it right for best operation of your motors, lights, and electronic equipment.

Positive voltage control. Voltage can be adjusted to compensate for line voltage drop or normal engine speed droop under heavy load.

Starts big motors fast! Coordinated regulator design gives quick response.

Easy to install, simple to operate. Fully self-contained. Requires no switchboard. Merely couple to engine and connect to load thru suitable switch.

Needs little maintenance. Only an occasional check for cleanliness and brush wear.

Fabricated steel frame. Rigid, dripproof frame keeps REG-AMP safe, clean, and dry.

Performs smoothly. Every design is painstakingly engineered. REG-AMP is a product of 50 years of E-M Generator experience.

Get more information from your nearby E-M Sales Engineer. Also, write E-M for publication PRD-246 . . . it gives complete REG-AMP ratings.

E-M

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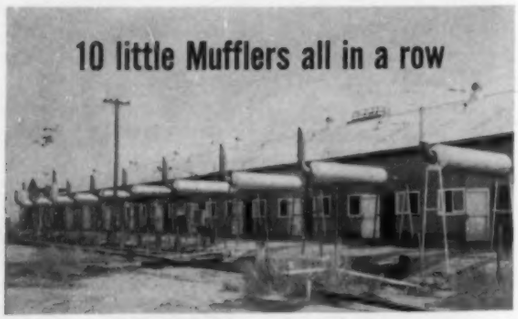
Minneapolis 13, Minnesota

Largest manufacturer of "Packaged" Generators



...and they're all Kittell's!

In areas where little or no exhaust noise can be tolerated, use Kittell residential-type silencers—like the ten horizontally-mounted KR's shown above. The unique features of Kittell silencers and spark arrestors are the result of more than 15 years of silencer design and fabrication experience. Models are available for almost all industrial, mobile and marine applications. Excellent delivery on both standard models and specials. When local dealers do not have the desired size in stock, shipment is made from the factory in from one to four days. Special engineering also available when required.

Kittell

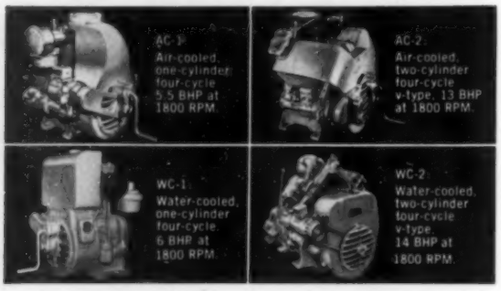
Write for new 1957 catalog just off the press.

Kittell Muffler & Engineering, Inc.

915 SOUTH SANTA FE AVENUE, LOS ANGELES 21, CALIFORNIA

THE BIG 4 IN DIESEL POWER

AMERICAN MARC and Hallett combine their resources to bring you the finest small Diesels made to fit every job. Write today for full details and specifications.


AC-1:
Air-cooled, one-cylinder, four-cycle 5.5 BHP at 1800 RPM.
AC-2:
Air-cooled, two-cylinder, four-cycle v-type, 13 BHP at 1800 RPM.
WC-1:
Water-cooled, one-cylinder, four-cycle, 6 BHP at 1800 RPM.
WC-2:
Water-cooled, two-cylinder, four-cycle v-type, 14 BHP at 1800 RPM.

AMERICAN MARC also manufactures Diesel generating plants from 3 to 10 KW (AC or DC, and industrial three-phase), Diesel pumping units from 4 to 1700 GPM, marine propulsion, refrigeration units and power-packages for other services. American MARC can adapt any of its Big 4 engines to fit every job requiring from 5 to 20 BHP.

SOME DESIRABLE SALES TERRITORIES ARE STILL OPEN. INQUIRIES ARE INVITED FROM REPRESENTATIVE DEALERS.

AMERICAN MARC INC.
DIESEL ENGINES

1601 West Florence Ave. Box 549, Inglewood, Calif. Telephone OR 8-7174

AMERICA'S LARGEST MANUFACTURER OF AIR-COOLED DIESELS

Mid-Continent Diesel News

By Jack F. Cozier

CITY OF Meade, Kansas, has purchased a model 38D8-1/8 Fairbanks-Morse 1600 hp, dual fuel diesel engine.

M. J. CROSE Mfg. Co., Tulsa, Okla., bought two GM 60 kw diesel units driving Lincoln automatic welders to be used for pipe line work. The sale was made by Diesel Power Co., Tulsa.

DARR Equipment Co., Caterpillar dealer, Dallas, Tex., is once again holding a series of preventive maintenance schools beginning in February and lasting through April. The schools will be held in Dallas, Gladewater, Wichita Falls and Waco, Tex., with an expected attendance of approximately 1000 Cat owners and their operators.

WALKER'S Austex Chili Co., Austin, Tex., bought a Kenworth model 825 truck powered by a Cummins 300 hp diesel engine for hauling their food products from Austin to the West Coast. The unit utilizes a 750C Luber-finer filter, Spicer model 8045 main transmission and a model 8035-G auxiliary transmission, Alcoa aluminum wheels, Kysor aluminum radiator shutter, Timken aluminum rear axle carrier assy., and Kenworth torsion bar suspension, aluminum frame & cab, Fiberglass front fenders all delivered by Texas-Kenworth Corp., Dallas, Tex.

LYLES & Buckner, Muskogee, Okla., have purchased a Cat 977 Traxcavator from McCormick Machinery Co., Tulsa, Okla., for surfacing contract work on the toll road.

S. E. EVANS Construction Co., Fort Smith, Ark., has bought a model 44 Lima crane powered by a GM 6-71 diesel engine. This road contracting company purchased this equipment from R. A. Young & Son, Inc., Tulsa, Okla.

VAPOR International Corp., Ltd., Chicago, Ill., purchased eight Fairbanks-Morse model 45B4-1/8, 10½ hp each, diesel generating sets.

PUBLIC Service Co., Tulsa, Okla., bought a 6-71 GM diesel engine for powering an eight inch Amco sand pump used for dredging work. The engine was supplied by Diesel Power Co., Tulsa.

VILBIG Construction Co., Dallas, Tex., is building an earth dam and dikes for Dallas Power & Light Co.'s new steam electric station utilizing a Cat D9 tractor, six Cat DW21 tractors with #470 scrapers, a Euclid S18 scraper powered by a GM diesel engine, an Allis-Chalmers HD-20 tractor, five Cat D8 tractors (three for push loading, one pulling a Ferguson roller, one pulling a Rome disc plow), four #12 Cat motor graders, and one Cat D7 tractor. All the Caterpillar equipment was purchased from Darr Equipment Co., Dallas, Tex.

CITY OF Memphis, Missouri, purchased a Fairbanks-Morse eight cylinder, model 38D8-1/8, 1280 hp generating set.

EFTON Boggs, Bixby, Okla., is using for irrigation a Chrysler butane IND-30A engine powering a Marlo four inch pump on his truck farm. The sale was made by Diesel Power Co., Tulsa, Okla.

COZAD Construction Co., Sulphur, Okla., has bought a Lima model 44 dragline powered by a Cat diesel engine for working near Oklahoma City on highway construction. The unit was delivered by R. A. Young & Son, Inc., Tulsa, Okla.

WILLIAMS Brothers, Tulsa, Okla., purchased two Cat D3-18 diesel units from McCormick Machinery Co., Tulsa, for use on a pipeline.

GRAVES Construction Co., Claremore, Okla., has repowered an Insley ½ yd back hoe with a 2-71 GM diesel engine from Diesel Power Co., Tulsa, Okla.

CITY OF Augusta, Kansas has ordered a model 38DD8-1/8 Fairbanks-Morse 1600 hp, dual fuel generating unit.

ED HOUST contractor, Jefferson, Tex., has bought two Cat DW15 tractors, one Cat D8 tractor and one Cat D6 tractor from Darr Equipment Co., Dallas, Tex. The units are being used for watershed construction and conservation work.

APACHE contractors, Tulsa, Okla., has received a Cat D7 pipelayer for pipeline construction work. The sale was made by McCormick Machinery Co., Tulsa.

AMERICAN Bridge Division of U.S. Steel Corp., Pittsburgh, Penn., bought a Fairbanks-Morse six cylinder model 38F5¼, 450 hp, diesel engine.

Western States Representative

Roots-Connersville Blower Division of Dresser Industries, Inc., has appointed G. M. Wallace & Company of Denver, Colorado as Field Application Engineers for all Roots-Connersville products. G. M. Wallace & Company headquarters are in Denver with offices in Salt Lake City, Utah and Butte, Montana. According to the announcement made today by Vice President D. A. Johann, the Wallace Company's appointment was

effective November 1, 1956. Territory assigned to them includes Colorado, Wyoming, Montana, Utah, New Mexico, eastern Nevada, southern Idaho and western Texas. G. M. Wallace & Company is headed by G. M. Wallace who, prior to forming his present company, was Assistant Sales Manager for the Bailey Meter Company.

Mr. Wallace is assisted in Denver by Jack Phillips, in Salt Lake City by R. E. Kunkel and J. S. Pearson, and in Butte by Paul Le Veaux and J. K. Archibald.

These men have all had broad experience in the application and use of industrial equipment and are well equipped to assist in the selection and application of Roots-Connersville products.

Harbormaster Catalog

Utility Series Harbormaster Outboard Propulsion and Steering Unit Catalog is announced by Murray and Tregurtha. Two-page catalog sheet illustrates and covers in detail the new Utility Series Harbormasters, which offer practically all the advantages of standard Harbormasters at considerably lower cost. Included in the catalog material are illustrations, applications, and a table of specifications. The Utility Series is in the 40-60 hp range. The full catalog, covering the standard models from 40 to 400 hp, is also available. Write Murray & Tregurtha, Inc., 80 Hancock Street, Quincy 71, Massachusetts. (ITS NEW)

P&H Distributor

The announcement of a new P&H diesel distributor for a three state area was made recently by the Diesel Engine Division, Harnischfeger Corporation, Crystal Lake, Ill. Named as distributor is the Rental Service Company, 4605 North 4th St., Philadelphia. Headed by Mr. Jack Davies as President and Sales Manager, the new P&H distributor is a division of Service Supply Corporation of Philadelphia.

Under the agreement, Rental Supply Company will sell P&H industrial diesel units and automotive diesel engines. P&H engines are available in 2, 3, 4 and 6 cylinder models ranging up to 280 hp. The new distributor will also sell the P&H diesel electrical generating sets which are sold in models of 20 to 125 kw capacities. The sales territory involved in the agreement is the entire state of Delaware; the state of Pennsylvania east of and including the counties of Tioga, Lycoming, Union, Snyder, Juniata and Franklin; and the state of New Jersey south of and including the counties of Mercer, Burlington and Ocean.

Four Sales Assignments

Four new assignments to further strengthen its sales and service staffs have been announced by Stewart & Stevenson Services, Inc. Additions are A. J. (Andy) Houseman, Houston, assistant to the Chief Engineer, and Richard T. Akeroyd, San Antonio, Sales Engineer. Louis E. Duncan is now on the sales staff for the Lubbock branch and Milton C. Marley is a Service Manager for the Corpus Christi branch. Mr. Houseman most recently was a project engineer for the Gibbs Corporation (shipyard) in Jacksonville, Fla. He has had extensive design experience.

Mr. Akeroyd conducted his own advertising service before joining Stewart & Stevenson. He has been associated in both the fields of newspaper and magazine writing and editing and also has studied engineering. Most recently with the Fairbanks, Morse Co. as a diesel engineer, Mr. Marley has a broad background in service work. A graduate of East Texas State College, Mr. Duncan until recently was a navigator in the U.S. Air Force.

Injector-sticking problem solved with Du Pont diesel fuel additives

A CASE HISTORY

A number of diesel tractor operators in one western farm area encountered frequent injector-sticking troubles. Downtime and maintenance costs mounted up.

One of the large fuel suppliers in the vicinity offered to help solve the problem. To get the benefit of an objective outside opinion, this fuel supplier also called in a Du Pont automotive fuel specialist. After careful study, the Du Pont man suggested the use of chemical additives in the fuel.

Following this recommendation, Du Pont Fuel Oil Additive No. 2 (FOA-2) and Du Pont Metal Deactivator (DMD) were added to the fuel as it left the refinery. To identify the fuel with the additives for test purposes, some dye was also added.

RESULTS

After using this fuel for two months, the tractor operators were interviewed. All reported that, where the additive-treated fuel was used, injector-sticking problems were nil.

It is because of results like these that many refiners now add FOA-2 and DMD to their diesel fuel before it leaves the refinery.

So, if you are encountering injector-sticking or filter-plugging problems in your diesel engines, we believe it will be to your advantage to try a fuel containing these two Du Pont additives.

DU PONT
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Better Things for Better Living . . . through Chemistry

Petroleum Chemicals

E. I. DU PONT DE NEMOURS & CO. (INC.) · Petroleum Chemicals Division · Wilmington 98, Delaware

Cummins Distributor Expansion

A recent run down of the improvements being made in Cummins marketing and service facilities is indicative of the rapid growth of the diesel industry. At Des Moines a new building has been finished and occupied; Fresno, California drawings are under way. At Montebello, Calif. a new building has been completed. At Milwaukee former facilities are being doubled in size. Montreal has expanded and modernized. At Newark, N. J. construction is under way on a new 24,000 sq ft building. At Portland, Oregon a new building of 30,000 sq ft has been occupied and a 7,500 sq ft warehouse added. At Reno a new building has been occupied. Hartford, Conn. is expanding present new facilities. A new plant has been set up at Anchorage, Alaska. Baltimore is set to go with a new plant. At Biloxi, Miss. drawings are completed for modern facilities. Preliminary plans are completed for a new setup at Chicago. For the new plant in Detroit construction is under way. Construction is progressing for a new plant in Cincinatti. A new building is being completed in Cleveland. All told this represents a vast amount of expansion in this country.

Six Trucks Delivered

Delivery of six Kenworth Model 925 trucks to Whitfield Transportation, Inc., of El Paso, Texas, is announced by Lewis T. Gerlach, general sales manager, Kenworth Motor Truck Company. Whitfield Transportation's new Kenworths have chrome manganese heat-treated steel frames, high-tensile steel wheels and a chassis weight of 13,320 lbs each. Drop-frame front-end design and Kenworth's torsion spring tandem axle drive are among weight-saving features in this custom-built order. Powered by Cummins NHB 200 horsepower diesel engines, the trucks have Fuller R96 10-speed Roadranger transmissions.

Specializing in the transportation of bulk and general commodities between Texas and the States of New Mexico, Colorado, Utah and Arizona, Whitfield Transportation, Inc., has added its new Kenworths to those already in service on regular daily schedules between El Paso, Albuquerque and Salt Lake City. The order was placed through the Phoenix branch of the J. T. Jenkins Company, Kenworth distributors.

Pipeline Headquarters

Construction has begun on a new $2-½ million, eight-story headquarters building in Salt Lake City for the Pacific Northwest Pipeline Corporation, Stuart F. Silloway, president of the company, has announced. Disclosure of the transmission company's plans for a new home office structure in the Utah capital follows an announcement that the necessary percentage of Pacific Northwest Pipeline stockholders have agreed to a merger of their company with El Paso Natural Gas Company. Mr. Silloway stated, however, that the timing of these two announcements has no direct connection except to verify previous statements of the officials of El Paso Natural and Pacific Northwest that the two pipelines will be operated as separate entities. When details of the stock exchange merger have been completed, Pacific Northwest is expected to function as a subsidiary of the El Paso company.

Pacific Northwest only recently began operation of its 2,400 mile pipeline system which extends from near the New Mexico-Colorado border to the Canadian boundary. The $212 million pipeline is currently delivering over 350 million cubic feet of natural gas per day from the Pacific acreage in the San Juan Basin of New Mexico and other Rocky Mountain fields to its principal markets in Washington, Oregon and Idaho as well as to other customers along its line. Pacific Northwest Pipeline spent its period of organization in Houston, Texas, and moved its headquarters to Salt Lake City only in the fall of 1956. The company presently occupies portions of two downtown buildings in Salt Lake and has stated that this space will be retained until the company's new quarters are available within eighteen months.

Pacific Northwest Pipeline is currently before the Federal Power Commission in hearings which contemplate Pacific, Colorado Interstate Pipeline and Natural Gas Pipeline of America delivering 475 million additional cubic feet daily to the Chicago area. The Pacific Northwest system will begin in the fall of this year importation of an initial 300 million cubic feet of gas daily from the Westcoast Transmission system now under construction from the Peace River area of Canada to join the Pacific system at the Canadian boundary. Facilities of Pacific Northwest Pipeline are ready to receive the Canadian gas, which is already under long term contract, with the exception of construction of a Compressor Station on the Pacific system at the Canadian border. This construction, as well as additional sales laterals and other expansion of facilities included in Pacific Northwest's 1957 $30 Million construction program, will be handled for the pipeline company by Fish Northwest Constructors, Inc., of Houston, Texas.

Naval Architects' Meeting

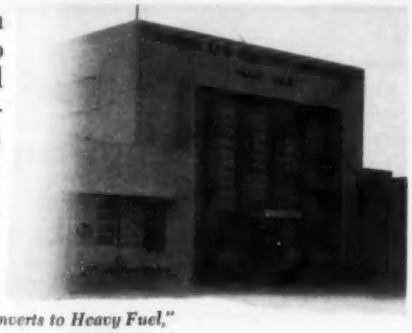
Some 500 members of the Society of Naval Architects and Marine Engineers will gather in Long Beach for the Society's spring meeting May 16-18 at the Lafayette Hotel. In Long Beach to confer with the meeting's steering committee, of which Thomas B. Forster and John T. Gilbride are co-chairmen, is the Society's national secretary, Capt. Wilbur N. Landers, USN (Ret.) Other members of the steering committee include Rear Adm. C. D. Wheelock, USN (Ret.), papers; W. A. Harrington and Capt. J. C. Woelfel, USN (Ret.), finance; John Marriner, social activities; Morris H. Kelley, registration; Rear Adm. R. K. James, USN, publicity; and Cdr. Raymond LeBer, USN, assistant for publicity. Also working with the committee are Harold D. Ramsden, chairman of the Southern California Section of the Society, and Myles Rados, secretary-treasurer of the Southern California Section.

Bohn Retires

Donald I. Bohn, widely known in the electrical and power generation field as a designer, inventor and engineer, has retired from Aluminum Company of America after more than 34 years of service. Mr. Bohn, whose retirement became effective January 1, had been Alcoa's manager of special electrical development engineering since 1953. Previously, he had served for nine years as the company's chief electrical engineer.

During his career with Alcoa Mr. Bohn obtained over fifteen patents in the electrical field, covering developments in protection devices, accessories, current converting systems and welding apparatus. He also wrote numerous authoritative engineering articles. One of Mr. Bohn's important contributions to the aluminum industry, and to the power industry in general, was his development of innovations in gas engine de-

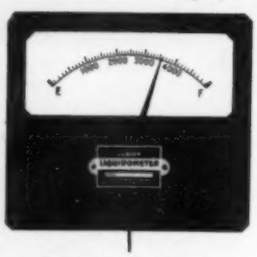
* For further details of equipment I refer you to the table of equipment. Good accessories are so essential to an efficient plant — Marathon is blessed with a careful, experienced selection of proven, dependable auxiliary units. I've enjoyed my visit down here to the Keys, as I did last year. The cooperation extended me by [illegible]ger Leonard Martin of the Coop, Bill Nicholls [illegible] Griffin of the engineering staff has help[illegible] is sincerely appreciated.



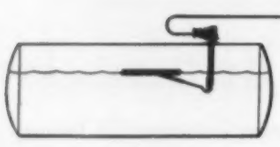
* EQUIPMENT TABLE

Exhaust snubbers-Burgess-Manning
Batteries-Gould
Fuel transfer and unloading pumps-Roper
Primary and Secondary fuel heaters-Ross
Fuel oil filters-Purolator
LIQUID LEVEL GAUGES-LIQUIDOMETER JR.
Fuel oil meter-Rockwell
Fuel oil purifiers-DeLaval
Fuel oil strainer (final)-Air-Maze
Final fuel oil heater-Ross
Steam condenser-Ross
Turbocharger-Climalux Immersion
Switchboard-Westinghouse
Water cooler-Ross
Consulting Engineers—F. P. McLean

* *Excerpts from "Marathon Converts to Heavy Fuel," in Diesel Progress, March 1957.*



The "Junior" model shown here was used in the above installation. It has a 7" x 6¼" case.



Liquidometers are selected for the liquid level gauging where dependability and durability are required. Remote indication is provided by a closed hydraulic transmission system which supplies a completely automatic and instantaneous reading of tank contents without use of an outside source of power. All models feature large easy to read dials designed to fit individual requirements. Liquidometers are giving years of trouble-free operation in all types of industry and moving vehicles. Write for information on the complete Liquidometer automatic gauging line.

Since 1920 ...of proven quality

THE LIQUIDOMETER CORP.
LONG ISLAND CITY 1, NEW YORK

sign which resulted in the adoption of the radial gas engine as a source of industrial power.

Introduces Electric Plants

Graybar Electric Company has made available to its customers, a complete line of diesel engine driven power plants. Produced by Winpower Manufacturing Company of Newton, Iowa, the sets are available from 400 watts through 100 kw. Graybar is also prepared to quote on diesel plants up to 600 kw. This wide range of sizes provides a unit for every need of standby electric service or prime power at locations removed from power company service. The lightweight construction, compact design and medium speed operation of the new Graybar line offers special advantages to customers who purchase electric generating plants: 1. The engines are manufactured by Continental which has national service facilities. 2. All units are direct connected engine generators.

Centrico Releases Bulletin

A new bulletin describing continuous self-cleaning separators, clarifiers and extractors with automatic sludge discharge, has just been announced by Centrico, Inc., distributors of Westfalia Separator A. G. Particularly suitable for processing liquids that have too high a solids content for conventional separators with solid wall bowls, the Westfalia desludgers perform such operations as purification, separation, clarification, polishing and de-watering for a wide variety of industrial applications.

The basic Westfalia de-sludger is the marine type SAOG-4016, with gravity discharge of both liquid phases, which was developed for marine operations and is primarily used as a residual fuel oil and diesel lube purifier. Liquid-Seal de-sludgers, featuring built-in centripetal pumps for pressure discharge of liquid phases, are developments from the basic SAOG-4016 model. These de-sludgers are particularily applicable to the processing of volatile liquids. Discharge of the liquid phases is enclosed, foamless, and under pressure by built-in stationary centripetal pumps. Instead of the hinged light metal hood used on the basic SAOG unit, the Liquid-Seal desludgers use a sheet metal hood with appropriate feed and discharge lines.

The booklet illustrates the complete line of Westfalia de-sludgers, and includes cutaways, applications, technical data and capactty charts. Copies of the booklet may be obtained by writing to Centrico, Inc., 75 West Forest Ave., Englewood, N. J. Ask for booklet 2177. (ITS NEW)

New Crude Pipeline

A large diameter crude oil pipe line from Delaware Bay to Greater Philadelphia area refineries will be built by a new corporation, Cape Pipe Line Company. Incorporators are Sun Pipe Line Company, Empire Gas & Fuel Company, subsidiary of Cities Service Company, and Atlantic Pipe Line Company. Announcement was made by W. C. Kinsolving, president of Sun Pipe Line Company. Triggering the move is the fact that supertankers now built and on the ways require deeper channels than the present 40-foot depth which the Dalaware River provides up to Philadelphia.

While the new pipe line will be a multi-million dollar project, it will be far cheaper than dredging the Delaware to a depth that would permit the huge 45,000 to 100,000 deadweight ton vessels to enter. Even now some supertankers anchor in Delaware Bay and discharge part of their cargo of crude oil into normal-sized tankships before entering the river.

While engineering studies will determine final details, indications are that an unloading bulkhead will be built four to five miles offshore in water 50 ft deep or more. Submarine pipe lines will connect these facilities with extensive tank storage ashore where several million barrels of crude oil in various grades can be held prior to shipping inland. Daily capacity of the line is contemplated at more than half a million barrels. Problems of engineering, acquisition of land and purchase of steel and other supplies set the approximate completion date some time in 1960.

Storage Batteries Report

To help engineers evaluate the practicability of miniature Nickel Cadmium Batteries for switchgear, diesel engine starting and portable electrical equipment—Nicad's high output sintered plate nickel cadmium storage batteries are described in an eight-page technical report. Details of development, construction, and operation are shown along with curves of discharge and charge characteristics. Write to Nickel Cadmium Battery Corporation, 66 Pleasant Street, Easthampton, Massachusetts for this report. (ITS NEW)

Clayton Appoints Adams

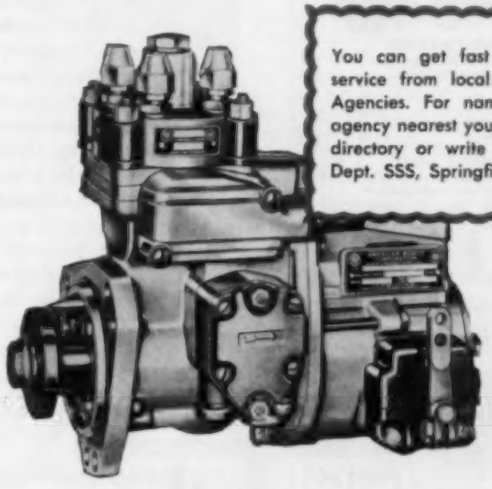
The appointment of R. D. (Roy) Adams as Director of Sales for the Steam Cleaner, Dynamometer and Chemical Divisions of the Clayton Manufacturing Company, El Monte, California, is announced by J. A. Cortright, Vice President - Sales. Adams will succeed Walter Wood, who, at his own request and for the purpose of reducing travel time, will take over as Regional Manager for the eleven western states under Adams.

According to Cortright, Adams was selected for his outstanding ability as a sales leader and for his intimate knowledge of jobbing problems. He is best known in automotive circles where for more than 30 years he was associated with the Chanslor & Lyon Company of California, as Branch Manager, General Sales Manager and President of that concern.

District Sales Representative

Promotion of Arthur J. Marcussen to district sales representative, Chicago region, is announced by Victor E. Rennix, general sales manager of Electro-Motive Division of General Motors. A native of Chicago and graduate of Illinois Institute of Technology, class of 1945, Mr. Marcussen joined Electro-Motive in February of 1947, upon discharge from the Navy. Starting as a service operating instructor, he became an instructor in the Diesel Training Center at La Grange in July of 1949 and an analyst in the market analysis section in 1950. Called back in the Navy for two years in 1952, Mr. Marcussen served as inspection officer in the Submarine Service. Returning to Electro-Motive in January of 1954, he became a sales engineer in the rebuild section, the position he held prior to his recent appointment.

Power plant is like a family of people living together in fair harmony except for a few annoying traits in each member. You will put up with imperfections when you understand the degree of dependability and lasting qualities each one possesses despite the faults. That's how it is with engines, pumps, filters and all the rest of the shebang around you. Live with it and like it and if you can't like it live with it anyhow.



You can get fast and economical service from local American Bosch Agencies. For name of authorized agency nearest you, check your local directory or write American Bosch, Dept. SSS, Springfield, Mass.

the PSB fuel injection pump

UNEXCELLED

. . . for performance and outstanding service—that's the acknowledged record of more than 140,000 American Bosch PSB pumps now in use.

Here's some reasons why! Simple construction . . . fewer parts . . . accurate fuel metering and distribution . . . positive governor control . . . replaceable hydraulic head for fast field servicing.

What's more—all American Bosch fuel injection products are backed by a growing system of authorized service agencies, fully equipped to provide quick, efficient repair service.

Unequaled value—for top diesel engine performance and economy of operation . . . long trouble-free life . . . lower maintenance expense—nothing equals a PSB fuel injection pump.

AMERICAN BOSCH

AMERICAN BOSCH

Division of

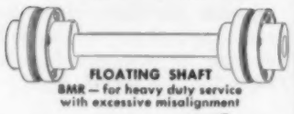
American Bosch Arma Corporation

Springfield 7, Mass., U. S. A.

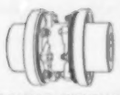
4493-B

FOR MAINTENANCE FREE POWER TRANSMISSION
Specify
THOMAS
FLEXIBLE COUPLINGS

DOUBLE FLEXING
DBZ — for high speed, heavy duty drives



FLOATING SHAFT
BMR — for heavy duty service with excessive misalignment



DOUBLE FLEXING
AMR — for engine and medium speed drives

SINGLE FLEXING
SS — for engine-driven generator sets with out-board bearings

Thomas' 40 years of flexible coupling experience is at your disposal to help you meet ordinary applications or special variations for unusual cases.

UNDER LOAD and MISALIGNMENT ONLY THOMAS FLEXIBLE COUPLINGS OFFER ALL THESE ADVANTAGES.

1 Freedom from Backlash Torsional Rigidity
2 Free End Float
3 Smooth Continuous Drive with Constant Rotational Velocity
4 Visual Inspection While in Operation
5 Original Balance for Life
6 No Lubrication
7 No Wearing Parts
8 No Maintenance

Write for Engineering Catalog 51-A

THOMAS FLEXIBLE COUPLING CO.
WARREN, PENNSYLVANIA, U. S. A.

C. Lee Cook Sales Meeting

C. Lee Cook Company recently held a large sales meeting of their representatives from all over the country at their Louisville, Kentucky plant. Mr. William S. Barnes, General Sales Manager of the Company presided at the event.

The group pictured above that attended the meeting can be identified as follows, reading from left to right: FIRST ROW: Fred R. Bell, Jr., Bell & Company, Mobile, Alabama. T. V. Sords, T. V. Sords, Cleveland, Ohio. Morgan Washburn, Morgan Washburn Co., Los Angeles, Calif. Woods Martin, T. F. Hudgins & Assoc., Houston, Texas. John Hellner, The Darling Company, Denver, Colorado. M. A. Boulden, M. A. Boulden, Wayne, Pennsylvania. F. G. Sebastian, Sebastian Diesel Equip. Co., Joplin, Missouri. J. C. Lepic, C. Lee Cook Co., Downers Grove, Ill. Joseph C. Buerkle, Joseph C. Buerkle Co., New York City. T. F. Hudgins, T. F. Hudgins & Assoc., Houston, Texas.

SECOND ROW: Alvin Pallast, C. Lee Cook Co., Louisville, Ky. Raymond W. Raney, C. Lee Cook Co., Louisville, Ky. Walter B. Rains, C. Lee Cook Co., Louisville, Ky. Ray Eyl, C. Lee Cook Co., Louisville, Ky. Robert Pohlmann, C. Lee Cook Co., Louisville, Ky. M. H. McWilliam, Engineering Equip. Co., Montreal, Canada. Emmett Swann, C. Lee Cook Co., Louisville, Ky. Gene Schum, Schum Engineering Sales Co., Hamilton, Ohio. Robert Wohlheuter, C. Lee Cook Co., Louisville, Ky. R. W. Hoyt, C. Lee Cook Co., Louisville, Ky. Thomas Furlong, C. Lee Cook Co., Louisville, Ky.

THIRD ROW: Philip L. Kleinhenz, C. Lee Cook Co., Louisville, Ky. George Parks, C. Lee Cook Co., Hutchinson, Kansas. W. H. Barnes, C. Lee Cook Co., Louisville, Ky. Charles Wagner, Tate Engineering Inc., Baltimore, Md. Dave Boulden, M. A. Boulden, Wayne, Pennsylvania. G. B. Gilliam, C. Lee Cook Co., Tulsa, Oklahoma. C. T. Duke, C. Lee Cook Co., Louisville, Ky. J. P. French, T. F. Hudgins & Assoc., Odessa, Texas. Earl Friedrich, C. Lee Cook Co., Louisville, Ky. Raymond C. Kantlehner, C. Lee Cook Co., Louisville, Ky. P. W. Mettling, C. Lee Cook Co., Louisville, Ky. John E. Scoggan, C. Lee Cook Co., Louisville, Ky. C. J. Kremer, Jr., C. Lee Cook Co., Louisville, Ky. Wm. G. Probst, C. Lee Cook Co., Louisville, Ky.

Diesels Replace Gasoline Units

Ten International model DC-405-L tractors with sleeper cabs to serve Sterling Aluminum Products, Inc., have been placed in service by Willolita Transports, Inc., truck leasing operation. The diesel units, one of which is shown in front of the firm's office, are equipped with 175 hp Cummins JT-6-B engines and transport Sterling pistons from St. Charles, Mo., to points in Indiana, Michigan, Ohio, and New York, with raw material as backhaul freight. Average payload runs about 36,500 lbs. The International tractors, constructed of lightweight, durable materials, replaced a fleet of gasoline-powered six-wheel units.

District Manager

G. B. Wright

Louis Rove, District Manager of Nordberg Manufacturing Company's Great Lakes Territory has announced his retirement, effective March 1, 1957. G. B. "Burke" Wright has been named to succeed Rove. Wright will follow both stationary and marine engine sales in Michigan, Indiana, Ohio, Kentucky and western Pennsylvania and marine engine sales in the Chicago area and on the Ohio River from Evansville to Pittsburgh. His headquarters will be at the Company's main offices in Milwaukee. Wright joined Nordberg in 1948 and has been Manager of the Power Chief Engine Department since 1950. Previously, he was engaged in municipal and industrial sales of Nordberg heavy duty engines in the Great Lakes area and was a sales engineer with Sterling Engine Company. Mr. Wright graduated from Cornell University in 1942 with a B.M.E. degree and served four years in the U.S. Coast Guard as Engineer Officer and later as Commanding Officer of a Destroyer Escort.

Distributor Sales Manager

Appointment of Daniel T. Wetta to the position of sales manager for distributor sales is announced by Lewis T. Gerlach, general sales manager for Kenworth Motor Truck Company of Seattle. Wetta has been with Kenworth in sales work since November, 1945. For the last three and one-half years, he has been assigned to new and used Kenworth truck sales in Seattle and the surrounding area.

The Seattle heavy-duty motor truck manufacturing concern is represented by distributors in the United States and most foreign countries. Wetta was born in New Orleans and attended Fortier High School in that city. He was graduated from Louisiana State University at Baton Rouge. During World War II, he served four and one-half years as a pilot in the U.S. Naval Air Corps.

New Oil Filters

A new series of Oil Filters has been announced by the Hilliard Corporation of Elmira, New York. Designated the R Series the new filter features a throw-away cartridge and easy service of the simplified three piece construction. The R Series Hilco Hyflow Oil Filters are especially designed for the filtration of lubricating and fuel oils used in internal combustion engines, for oil bath air filters and for the filtration of various types of industrial oils, fuel oils, solvents and coolants used in the manufacturing and chemical process industries. For specifications, application data, flow rate, pressure and viscosity data write for Hilco Bulletins F-135, F-153 and F-154, The Hilliard Corporation, Elmira, New York. (ITS NEW)

Brochure On Power Units

Detroit Diesel's complete line of two-cycle power units for the oilfields are fully described and illustrated in a 16 page brochure just released. Covered are the Division's new Turbopower models, diesel-electric sets, single and multiple-engine units from 60 to 762 hp.

Also covered are torque converter models and marine propulsion units for craft servicing offshore operations. Copies may be obtained from Detroit Diesel distributors and dealers or by writing Detroit Diesel Engine Division, General Motors Corporation, Detroit 28, Michigan. (ITS NEW)

Lubricating Dept. Manager

Paul A. White, who has been associated with the company since 1937, has been appointed manager of the lubricating department of Socony Mobil Oil Company, Inc., Vern A. Bellman, general manager of domestic marketing, has announced. He succeeds P. W. Judah, who earlier this week was named manager of the company's newly-created petroleum chemicals department.

Mr. White started his career with Socony Mobil as an industrial sales engineer. In 1943 he was promoted to sales supervisor. Then followed promotions to chief engineer of the Wadhams Division at Milwaukee and to division industrial manager. In 1955 he was appointed manager of the engine builders division in the lubricating department at the headquarters office in New York.

Deutz Distributor

Slattery, Inc. of 463 Locust Street, Akron 7, Ohio, has been appointed new distributor for Deutz air-cooled automotive diesel engines imported from Kloeckner-Humboldt-Deutz AG., Cologne, West Germany, it has been announced by R. D. Friedlander, General Sales Manager of Diesel Energy Corp., 82 Beaver Street, New York City, sole United States representative of Kloeckner-Humboldt-Deutz AG. The German company is a large manufacturer of air-cooled diesel engines and since 1948 more than 300,000 diesel engines have left the assembly line in Cologne.

Adds Sales Specialist

Electric Machinery Mfg. Company, Minneapolis, Minnesota, announces the addition to its field sales force of Mr. George Savage. Mr. Savage is a University of Minnesota graduate with a degree in Industrial Engineering. He has been with Electric Machinery Mfg. Company for the past eight years, primarily in the Production Department. Mr. Savage will concentrate on the application and sale of Electric Machinery Company's line of Packaged Generators. He will headquarter in Minneapolis with sales assignments covering the United States.

Buys Industrial Locomotives

The Tata Iron and Steel Co. of Jamshedpur, India, has ordered over a half million dollars worth of industrial locomotives from General Electric as part of a major plant expansion. Two of the largest diesel-electric industrial locomotives built by General Electric, with ratings of 115 tons and 720 hp, are among the seven units called for in the contracts. Because the locomotives will operate in temperatures ranging up to 120 degrees, one hundred per cent humidity and extremely dusty conditions, all will be fitted with air filters to the engine cab and traction motors. The other locomotives ordered include four 80-ton diesel-electrics and one 25-ton diesel-electric. All will be broad (66 in.) gage. Delivery started in February.

Compressor Line Bulletin

A new, 16-page bulletin, showing a complete line of small, air-cooled compressors for industrial, automotive, commercial and general use, is offered by Gardner-Denver Company, Quincy, Illinois. The compressors described are widely used for a variety of shop jobs—from providing air for anything from hammers and hoists to vacuum cleaners and laundry presses. Both one-and two-stage compressors are offered, with working pressures ranging from 85 to 175 psi. Models shown include bare compressors and those with horizontal and vertical tanks. The latter models are designed for use in limited space. Complete specifications for each model are given. A popular trailer model used extensively by contractors, utilities, stone masons, industrial plants, painters and monument makers is also included.

Gardner-Denver compressors are offered with a wide selection of controls for automatic starting and stopping, and for constant speed installations. In addition, weatherproof, explosion-resistant and gas-tight controls are available. Two handy charts—one for figuring compressor needs and another showing estimated free air consumption for 30 common shop jobs—are printed. A copy of this bulletin—AC-15—is available upon request. Write Gardner-Denver Company, Quincy, Illinois. (ITS NEW)

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***Sudbury* WATER STRIPPERS**

Scientifically designed to remove all water from diesel, gasoline or any light fuel oil. Condensation can load tanks and fuel lines with water, causing severe damage to injectors. Sudbury Water Stripper is easy to install, easy to clean. Model A, rated 20 gals. fuel per hr. $43.95; Model B, up to 50 gals. per hr. $76.95. Special sizes on order.

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A pipeline operator writes about DIESEL ENGINE CATALOG Volume 21 . . . "The information and data presented in this volume is, as in previous volumes, invaluable to us in keeping informed of the diesel equipment being built and placed on the market."

An accessory manufacturer writes . . . "The completeness of this Catalog is valuable to us in our efforts to adapt our products to the various engines manufactured, particularly in regard to gathering engine torque specifications."

A design engineer writes . . . "I have examined Volume 21 completely from cover to cover, and can only say I would not think it possible to make so many additions and improvements over last year's Edition. This issue certainly more than lives up to its reputation of completeness of presentation and attractive make up."

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Volume Twenty-One

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OGP Meeting Program

Just before going to press for the April issue we received the following tentative program for the 29th Annual Conference and Exhibits of the Oil and Gas Power Division of ASME to be held at the Kentucky Hotel, Louisville, Kentucky from May 20 - 23, 1957. This program is only tentative and is subject to change in the final official program. There are, however, many fine papers listed below to be given at the meeting, which promises to be an excellent one.

Technical Session I: 9:30 a.m. - May 20—Chairman, Ervin Dahlund; Vice Chairman, George Dashefsky. "Variations In Marine Engine Performance with Departures from Design Conditions of the Propeller" by Frank C. Vibrans, Jr., Fairbanks-Morse & Co. "Chromium Plating Development at the U.S. Naval Engineering Experiment Station" by R. W. Reynolds, U.S. Naval Engineering Experiment Station.

Technical Session II: 2:00 p.m. - May 20—Chairmain, A. C. Grammer; Vice Chairman, W. J. Fritton. "Sizing of Centrifugal Separators for Residual Fuels" by Kurt Froehlich, Nordberg Mfg. Co. "The Use of Heavy Fuels on River Towboats with High Speed Diesel Engines" by E. Renshaw, St. Louis Shipbuilding & Steel Co.

Special Lecture: 8:00 p.m. - May 20—Chairman, Robert Cramer, Jr.; Vice Chairman, Brian Corrigan. "Residual Fuels for Diesel Engines" by Lee Schneitter, Ebasco Services, Inc.

Technical Session III: 9:30 a.m. - May 21—Chairman, W. C. Fischer; Vice Chairman, John C. Gibb. Panel Discussion—"Piston Rings for Oil and Gas Engines." Panel members are: H. G. Braendel, Wilkening Mfg. Co., W. M. Kauffman, Worthington Corp., Fred Robbins, Koppers Co., Inc., Leo T. Brinson, Nordberg Mfg. Co., and C. J. Kremer, Jr., C. Lee Cook Co.

Technical Session IV: 9:30 a.m. - May 22—Chairman, G. W. Ferguson; Vice Chairman, O. H. Moore. "A Practical Engine Scope for Field Maintenance" by E. Eugene Ecklund, Allen B. DuMont, Inc. "A Study of Industrial Engine Operation" by H. E. Fisher, Tennessee Gas Transmission Co. and Vernon Miles, Sperry Gyroscope Co.

Technical Session V: 2:00 p.m. - May 22—Chairman, T. H. Pofahl; Vice Chairman, George White. Panel Discussion—"Engine Intake Air Conditioning." Panel members are: R. E. Brown, Air-Maze Corp., W. R. Brooks, Cooper-Bessemer Corp., D. M. McMakin, American Air Filter, Inc., and Tracy Park, Tennessee Gas Transmission Co.

Technical Session VI: 9:30 a.m. - May 23—Chairman, W. E. Warner; Vice Chairman, D. M. McMakin. "Effect of Intake Combustion-Air Conditioning on Performance of Gas Fired Internal Combustion Engines" by W. F. MacInnes and R. L. Solnick, Flour Corp. "Turbocharger Development for the Two-Cycle Engine" by John D. Hines, Cooper-Bessemer Corp.

Technical Session VII: 2.00 p.m. - May 23—Chairman, W. M. Kauffman; Vice Chairman, Ralph

Leadbetter. "Gas Pulsation—The Problem, SGA's Approach and Results" by E. N. Henderson, Arkansas Louisiana Gas Co. "An Apraisal of Compressor Cylinder Cooling Requirements" by W. F. May, and A. G. Clark, Ingersoll-Rand Co.

American-Standard Elects

Richard S. Reade

John C. Linsenmeyer

John C. Linsenmeyer was elected an executive vice president, operations, of American-Standard, Joseph A. Grazier, president, announced recently.

In this position he will be in charge of a group of operating divisions producing industrial and engineering products. They produce industrial and commercial air conditioning and air handling equipment, power plant equipment, fluid drives, nuclear reactors and components, heat exchangers, steel boilers, valves and electronic and automatic controls.

Mr. Linsenmeyer formerly was president of the American Blower and Ross Heat Exchanger Divisions of the corporation. He is succeeded by John W. Brennan, who was named president of the American Blower Division, and Richard S. Reade, who was appointed president of Ross Heat Exchanger Division. Mr. Brennan previously was vice president, engineering, of the American Blower Division. He has been associated with the division since 1928 in a number of sales, engineering and management positions. Mr. Reade has served as executive vice president of the Ross Heat Exchanger Division since 1955. Prior to that he was director of purchases of the American-Standard Plumbing and Heating Division. He began his career with American-Standard in 1934.

Three New Marine Diesels

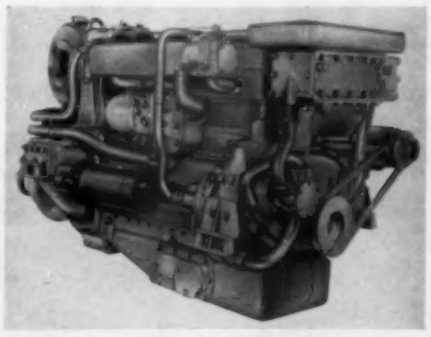
Hercules Motors Corporation, Canton, Ohio has introduced three new marine diesel engines. These new models now provide a total of nine different sizes of marine diesels, ranging from 15 to 265 hp in 2, 4, 6 and 8 cylinder models. Hercules marine diesels are designed for low economical operation in pleasure craft and workboats alike. With the addition of the new turbo-charged diesels, Hercules marine diesels are now available as natural aspirated, super-charged and turbo-charged engines to meet the various needs of the industry.

The new DIX-2 DM is a 2-cylinder model with a 4¼ in. bore x 4½ in. stroke. This 127.5 cu in. engine produces 30 hp @ 1800 rpm. The DIX-2DM is 36 ¾ in. long, 25¾ in. wide and 21¾ in. high above C/L. This model is especially suited as auxiliary power in larger sailing vessels.

The TCD-188M is a turbo-charged 4-cylinder marine diesel with a 3⅞ in. bore x 4 in. stroke which produces 105 hp @ 3000 rpm. This model is one of the most compact engines in the field. It is 46¾ in. long, 27 $\frac{13}{16}$ in. wide and 22⅞ in. high above C/L.

DIX-2DM model developing 30 hp at 1800 rpm.

The TCD-188M weighs 950 lbs, and it may be installed as a single propulsion unit or adapted for multiple unit installation.



TCD-283M model developing 160 hp at 3000 rpm.

The TCD-283M is a turbo-charged 6-cylinder marine diesel with a 3⅞ in. bore x 4 in. stroke and produces 160 hp @ 3000 rpm. This engine is the turbo-charged version of the Hercules DIX-6 marine engine. It is 55½ in. long, 27$\frac{13}{16}$ in. wide and 22⅞ in. above C/L.

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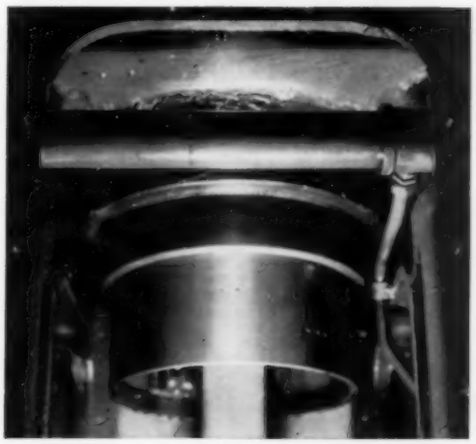
(l. to r.) Carl Olbertz, Milford plant superintendent, "Rollie" C. Bleimehl, Standard Oil industrial lubrication specialist and Frank Morgan, Milford chief engineer inspect crankcase. Rollie Bleimehl is qualified to give technical service on jobs like this. He's been doing this sort of work for 10 years. Rollie has a mechanical engineering degree from Iowa State College and has completed the Standard Oil Sales Engineering School.

23,000 hours on original rings and bearings—no overhaul

Milford, Iowa, Light Plant gets this performance from engine using STANODIESEL Oil M



"As is" photo of piston skirt and interior of crankcase. No wiping or cleaning was done before photographing or at any time during 23,232 hours engine has been in service. STANODIESEL Oil M is the lubricant.

When a new 720 H.P. Superior engine was put in service at Milford, Iowa in 1949, the plant management knew what oil they were going to use—STANODIESEL Oil M. Their choice was based on previous experience with Standard diesel oils in other engines.

After 23,232 hours of operation, the engine at Milford is still operating with the original bearings and rings. It has not been overhauled. The crankcase, as shown in the photo, is clean. Pistons are clean and bright with no sign of wear. Twice yearly, oil samples have been taken for laboratory analysis. Each time the analysis has shown the oil to be in perfect condition. Good maintenance and STANODIESEL Oil M have contributed to this performance.

Got a hard job for an oil? STANODIESEL Oil M can do it. STANODIESEL Oil M has superior stability. Its additive formula helps to (1) prevent oil viscosity build-up (2) keep crankcase, pistons, cylinder walls and other parts clean (3) control foam (4) maintain film on difficult to lubricate areas and parts.

There's a Standard Oil industrial lubrication specialist near you in any of the 15 Midwest or Rocky Mountain States. Call him for more information about STANODIESEL Oil M. Or write Standard Oil Company, 910 South Michigan Avenue, Chicago 80, Illinois.

Quick facts about

STANODIESEL Oil M

- Keeps crankcase, pistons, cylinder walls clean.
- Combats deposit and wear problems imposed by use of economy fuels.
- Maintains film on difficult to lubricate areas and parts.
- Eliminates spark plug fouling in spark ignited engines and reduces combustion chamber ash deposits in engines burning natural gas, LPG and liquid fuels.
- Eliminates fuel injector and pump sticking caused by deposits on injector barrel and plunger where fuel and lube oil commingle.

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(Indiana)

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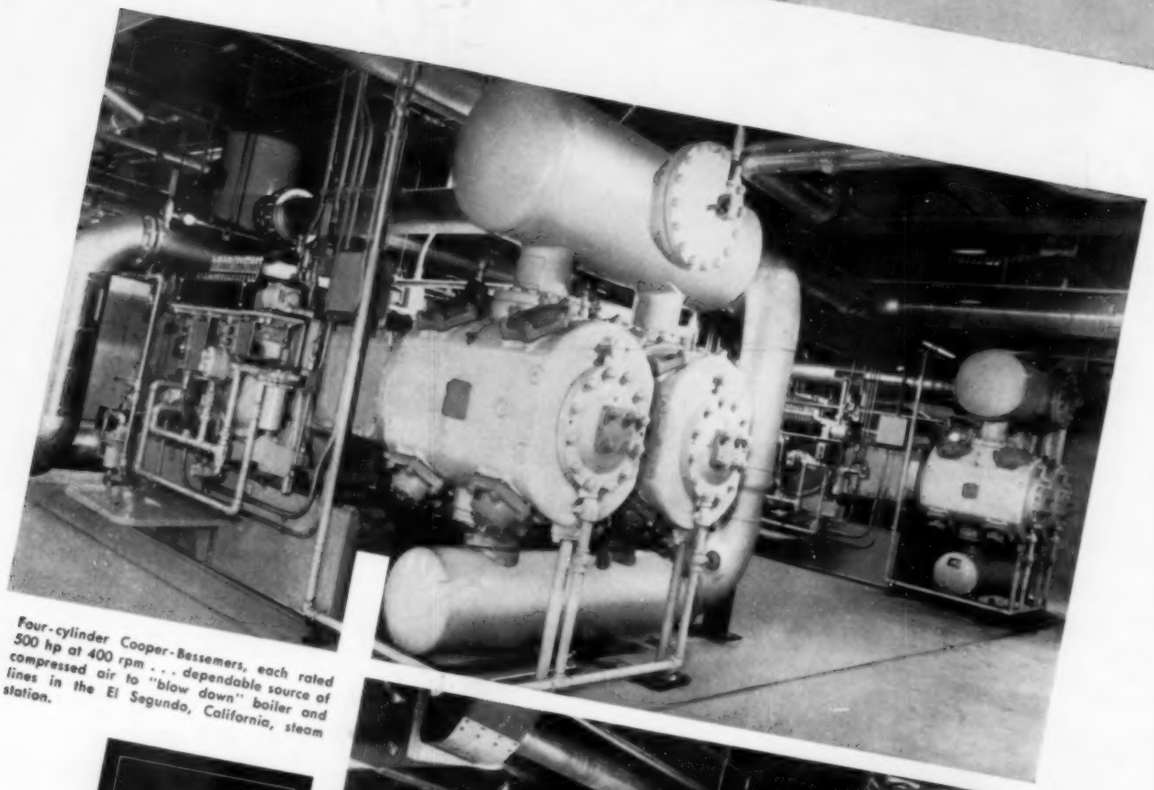
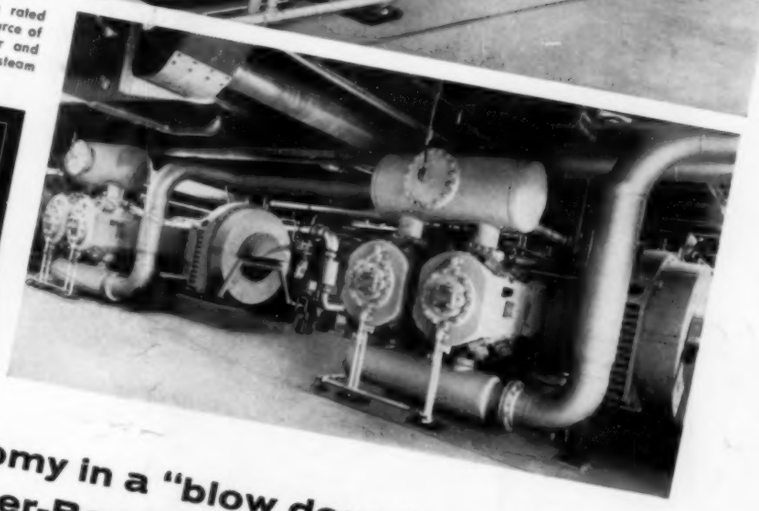


Four-cylinder Cooper-Bessemers, each rated 500 hp at 400 rpm . . . dependable source of compressed air to "blow down" boiler and lines in the El Segundo, California, steam station.

Another Example of Efficient Power at Lower Cost



UP goes economy in a "blow down" operation ....with Cooper-Bessemer compressors

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